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FASCICULUS 39

GALÁCZ ANDRÁS: GYENESPUSZTAI BAJÓCI ÉS BATH AMMONITESEK
(BAKONY HEGYSÉG)

A. GALÁCZ: BAJOCIAN AND BATHONIAN AMMONITES OF GYENESPUSZTA
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Dr. Géczy Barnabás
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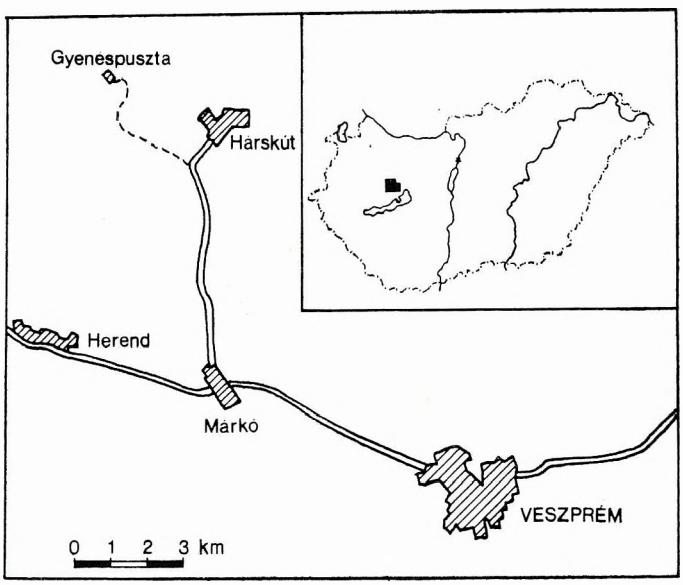
TARTALOM — CONTENTS

Gyenespuszta kicsiny majorság az Északi-Bakony középső részén, Hárskút községtől ÉNY-ra, a Hajag-csoport keleti peremén (1. ábra).

Az itt található jura képződményeket elsőként IFJ. NOSZKY J. ismertette (1943). Az akkori egyetlen feltárásban, a tanyaépület melletti kis barlangban megfigyelte, hogy a dachsteini típusú alsó-liász mészkőre üledékhézaggal és *szögdiszkordanciával* vörös mészkő rétegek települnek. Ez utóbbiakból *Parkinsonia parkinsoni* (SOWERBY) előfordulását említette. A Bakony hegység 1:25 000



1. ábra. Vázlatos térkép Gyenespuszta helyzetéről
Text-fig. 1. Location chart of Gyenespuszta

méretarányú földtani térképén (IFJ. NOSZKY 1957) a környékről alsó- és középső-liász, alsó- és felső-dogger mészköveket, valamint felső-dogger—alsó-malm radiolaritot jelzett. Később viszont (IFJ. NOSZKY 1961) azt írta, hogy Gyenespuszta környékén „... a mélyebb dogger és az egész liász sorozat hiányzik".

Az 1960-as években KONDA József részletesen tanulmányozta a Gyenespuszta környéki jura képződményeket. Számos ponton mesterséges feltárásokat létesített, és ezek rétegsorát közölte (KONDA 1970). Helyesbítette NOSZKY 1943-as megfigyelését, megállapítva, hogy a sorozat az üledékhézagos jura kifejlődési típusba tartozik, de a dachsteini mészkőre a középső-jura ammonitico rosso mészkő *paenakkordánsan* települ. A gyűjtött fauna alapján a rátelepülés korát a bajóci emeletben jelölte meg.

Az előzetesen gyűjtött fauna érdekesnek ígérkezett, KONDA J. a részletes vizsgálatokat egyetemi szakdolgozat témájául javasolta. Ebben a munkában (GALÁCZ 1968) részletes üledékföldtani, rétegtani és faunisztikai feldolgozásra került sor. A terepi bejárások során kiderült, hogy lehetőség van a területen meglevő teljes középső-jura mészkősorozat egy szelvényen belüli begyűjtésére. Az előzetes, rétegről rétegre gyűjtött Ammonites fauna vizsgálata kimutatta, hogy Gyenespusztán bath faunaelemek is találhatók. Bath Ammoniteseket korábban a Dunántúli-középhegységből nem említettek.

A gyenespusztai szelvények fontosságát felismerve KONDA J. irányításával 1968—1969-ben begyűjtötték a környék legteljesebb feltárását (VI. szelvény). A gyűjtőmunkát KOCSIS Lajos végezte el.

Magam is részt vettem a gyűjtésben, és azt számos kisebb kontroll-gyűjtéssel ellenőriztem és kiegészítettem. A gyűjtött Ammonites fauna feldolgozását az Eötvös Loránd Tudományegyetem Őslénytani Tanszéke és a Magyar Állami Földtani Intézet között létrejött szerződés tette lehetővé.

Az új gyűjtések eredményeit egy előzetes rétegtani publikáció tárgyalta (Galácz 1970), a fauna előzetes feldolgozását pedig doktori disszertáció ismertette (Galácz 1971).

A különböző gyűjtésekből kikerült hatalmas Ammonites anyag (kb. 4500 példány) feldolgozását 1969 és 1977 között az Eötvös Loránd Tudományegyetem Őslénytani Tanszékén végeztem. A munka lehetővé tételéért külön is köszönetet mondok Dr. Fülöp József akadémikusnak, a Központi Földtani Hivatal elnökének és Dr. Konda Józsefnek, a Magyar Állami Földtani Intézet igazgatójának, akik a munka elvégzéséhez anyagi alapot teremtettek. A pontos, megbízható gyűjtés Kocsis Lajos érdeme. A munka végzése folyamán igen sok segítséget kaptam hazai és külföldi kollégáktól. Tanácsaikat, információikat — a nevek felsorolása nélkül — köszönöm. A munkában végig szakmai tanácsokkal és útmutatásokkal segített Géczy Barnabás professzor, akinek sokirányú támogatása és ösztönzése nélkül ez a monográfia aligha készülhetett volna el.

Budapest, 1978. december 15.

KÖZÉPSŐ-JURA FELTÁRÁSOK GYENESPUSZTA KÖRNYÉKÉN

Gyenespuszta közvetlen környékén a képződmények tanulmányozása céljából a Magyar Állami Földtani Intézet 6 mesterséges feltárást létesített (2. ábra). A középső-jura helyi megismeréséhez érdemes röviden áttekinteni az egyes szelvények sorozatait, illetve ezek összefüggéseit.*

I. feltárás

A gyenespusztai majorépülettől ÉK-re, mintegy 75 méterre egy kis árokban tárták fel a középső-jura sorozat részletét. A szelvény (3. ábra) alsó részében az alsó-liász dachsteini mészkő rétegei találhatók. Egyenetlen felszínére 35—40 cm vastag ammonitico rosso mészkő következik, megegyező dőléssel (325°/12°). A vörös, gumós mészkő jómegtartású Ammonites faunát tartalmazott, melyet Konda J. gyűjtött. A faunában a következő alakok fordultak elő:

Phylloceras trifoliatum Neumayr
Calliphylloceras disputabile (Zittel)
Holcophylloceras zignodianum (d'Orbigny)
Lytoceras eudesianum (d'Orbigny) s. l.
Nannolytoceras polyhelictum (Böckh)
Lissoceras psilodiscus (Schloenbach)
Cadomites (Cadomites) daubenyi (Gemmellaro)
C. (C.) sturanii n. sp.
C. (C.) rectelobatus (Hauer)
Parkinsonia (Parkinsonia) parkinsoni (Sowerby)
P. (P.) sp. indet.
Vermisphinctes (Prorsisphinctes) sp. indet.

Ez a kis fauna a Parkinsonia parkinsoni Zónába tartozik. Valószínűleg az I. feltárásban megismert rétegekkel megegyező összletet tárt fel a közelben levő, ma már nem járható gyenespusztai barlang, melyből Noszky (1943) a *P. parkinsoni* előfordulását jelezte.

II. feltárás

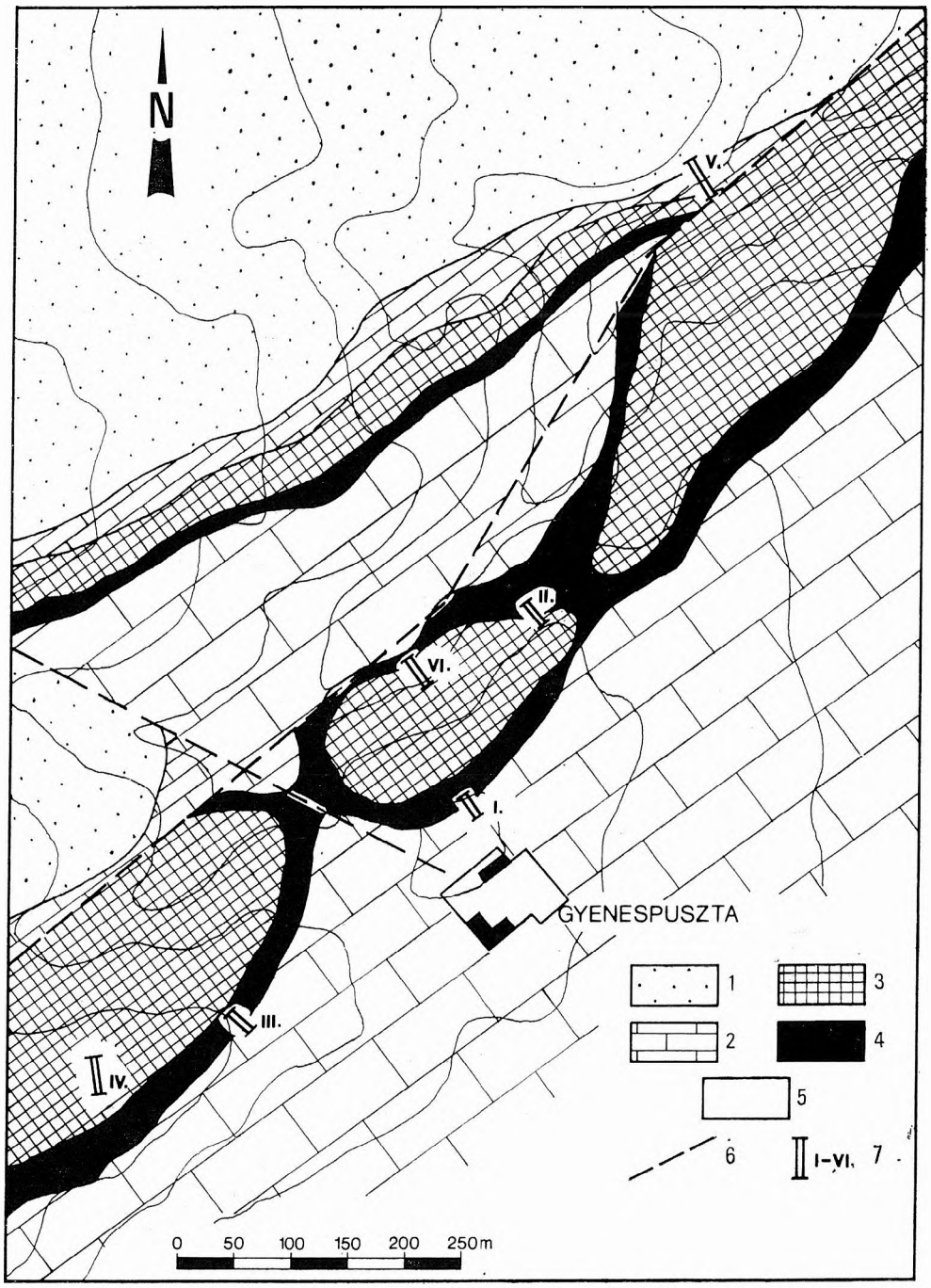
A gyenespusztai domb ÉNY-i lejtőjén, a majorépülettől kb. 200 méterre jól feltárt szelvényben vizsgálható az alsó—középső-jura sorozat.

A szelvény (4. ábra) alsó részén itt is az alsó-liász dachsteini mészkő található. Egyenetlen felszínét néhány cm vastag, foszlányokban megmaradt fekete mangános réteg borítja. Ebből a 2—15 cm vastag, meszes—mangános anyagból kitűnő megtartású toarci Ammonitesek kerültek elő, melyek az alsó-toarci Hiladites serpentinum Zónát jelzik.

A toarci mangános foszlányokkal fedett dachsteini mészkő felületére, közel azonos dőléssel (325°/12°) következnek a középső-jura ammonitico rosso mészkő rétegek. A 75 cm vastag középső-jura mészkőben 9 réteget lehetett elkülöníteni. Az alsó három rétegből makrofauna nem került elő, a felső rétegekből néhány rosszmegtartású Ammonitest sikerült gyűjteni:

Phylloceras sp. indet.
Holcophylloceras zignodianum (d'Orbigny)
Lytoceras sp. indet.

* A rétegtani besorolás a bajóci és bath standard zóna- és szubzóna-beosztást követi (1. táblázat; Parsons 1976, Sturani 1971 és Torrens 1967 nyomán).

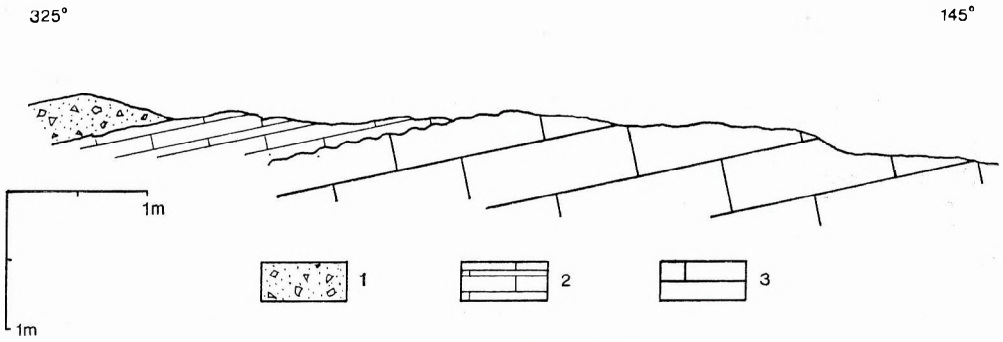


2. ábra. Gyenespuszta közvetlen környékének földtani képződményei és a vizsgált szelvények elhelyezkedése

1. Alsó-kréta képződmények, *2.* felső-jura mészkő, *3.* középső – felső-jura radiolarit, *4.* középső-jura vörös mészkő, *5.* alsó-jura dachsteini mészkő, *6.* törés, *7.* szelvények

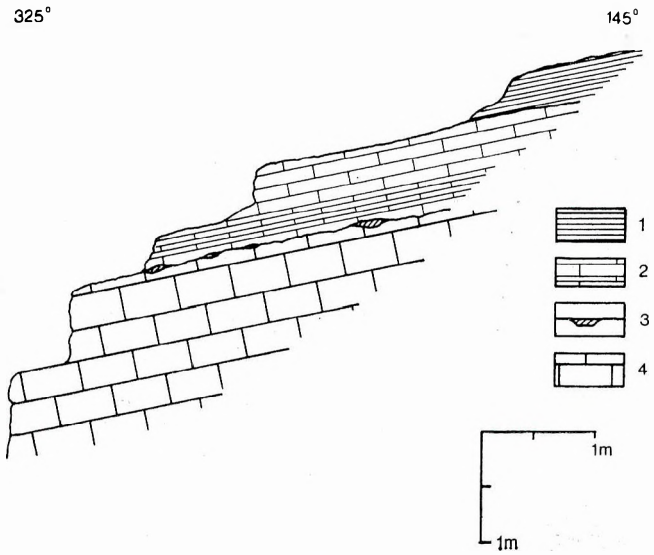
Text-fig. 2. Geological formations in the immediate vicinity of Gyenespuszta and location of the profiles studied

1. Lower Cretaceous sediments, *2.* Upper Jurassic limestone, *3.* Middle to Upper Jurassic radiolarite, *4.* Middle Jurassic red limestone, *5.* Lower Jurassic Dachstein Limestone, *6.* fault, *7.* profiles



3. ábra. A gyenespusztai I. feltárás földtani szelvénye
1. Radiolarit-törmelékes talaj, *2.* középső-jura (felső-bajóci) vörös, ammoniteses mészkő, *3.* alsó-liász dachsteini mészkő

Text-fig. 3. Geological section of Profile I at Gyenespuszta
1. Soil with radiolarite debris, *2.* Middle Jurassic (Upper Bajocian) red, ammonitic limestone, *3.* Lower Liassic limestone of Dachstein type



4. ábra. A gyenespusztai II. feltárás földtani szelvénye
1. Radiolarit, *2.* középső-jura vörös, ammoniteses mészkő, *3.* fekete, mangános, alsó-toarci mészkő foszlányok, *4.* alsó-liász dachsteini mészkő

Text-fig. 4. Geological section of Profile II at Gyenespuszta
1. Radiolarite, *2.* Middle Jurassic red, ammonitic limestone, *3.* black, manganiferous Lower Toarcian limestone rags, *4.* Lower Liassic limestone of Dachstein type

Cadomites (Cadomites) sp. indet.
Bullatimorphites stephanovi n. sp.
B. sp. indet.
Procerites cf. *hodsoni* ARKELL
Choffatia (Subgrossouvria) cerealis ARKELL
C. (S.) cf. *uriniacensis* (LISSAJOUS)

A szegényes fauna alapján a felső hat réteg a középső-bath Subcontractus és a felső-bath Retrocostatum Zónába tartozik.

III. és IV. feltárás

A két egymás közelében levő feltárás a gyenespusztai majorépülettől DNY-ra csupán a kőzetek felszínre bukkanását mutatja, a rétegeket vertikális kiterjedésben nem tárja fel. A két feltárás kőzetei egymáshoz nagyon hasonlóak, s a többi középső-jura feltárás kőzetanyagától erősen eltérnek.

A fekü itt is az alsó-liász dachsteini mészkő, erre következnek a változatos középső-jura vörös mészkő rétegek. A III. feltárásban a középső-jura mészkő anyagában a dachsteini mészkő szögletes törmeléke megtalálható. Ugyancsak a III. feltárásban *Bositrá*-s (*P. alpina* auctt.) lumasella rétegek is előfordulnak, az Ammonitesek azonban ritkák. Az előkerült néhány példány:

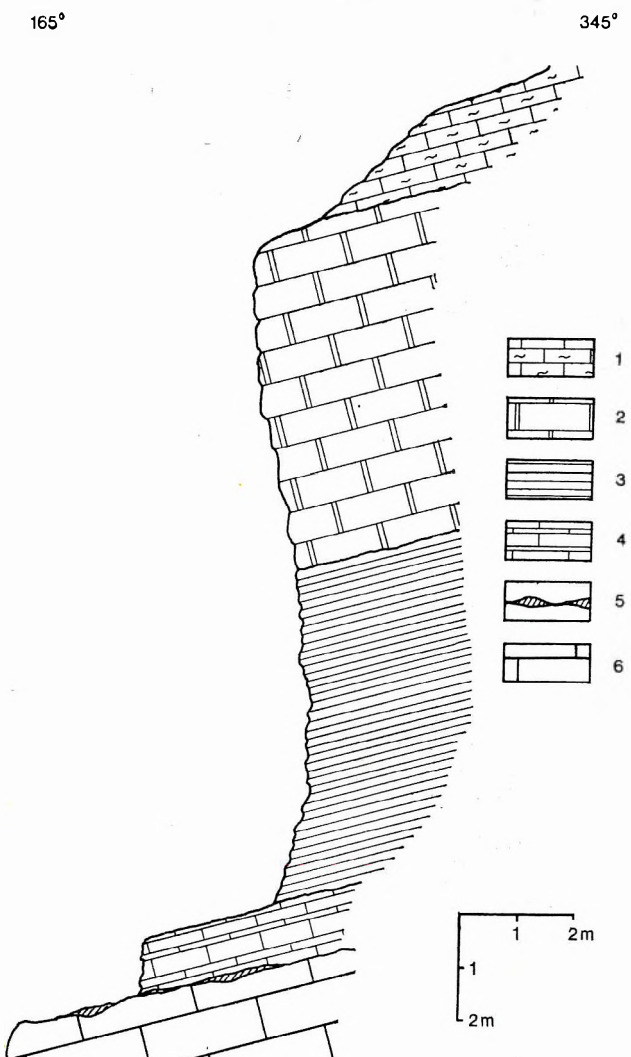
Adabofoloceras sp.
Holcophylloceras zignodianum (D'ORBIGNY)
Nannolytoceras polyhelictum (BÖCKH)
N. tripartitum (RASPAIL)
Lissoceras sp. indet.

A IV. feltárásban csak a középső-jura mészkő látható. Igen sok Crinoidea-töredéket, *Bositrá*-t és Brachiopodát tartalmaz, s ezek mellett gazdag Ammonites faunát is szolgáltatott. A kőzetkifejlődés és a fossziliák alapján korábban ezt a kőzetet jelezték „középső-jura Hierlatz mészkő"-nek (KONDA 1970, p. 190).

Az előkerült Ammonitesek:

Phylloceras spp.
Adabofoloceras subobtusum (KUDERNATSCH)
Holcophylloceras zignodianum (D'ORBIGNY)
Lytoceras eudesianum (D'ORBIGNY) s. l.
Nannolytoceras polyhelictum (BÖCKH)
Lissoceras sp. indet.
Cadomites (Cadomites) rectelobatus (HAUER)
C. (C.) sp. indet.
Dimorphinites (Dimorphinites) dimorphus (D'ORBIGNY)
Parkinsonia (Parkinsonia) sp. indet.

A fauna alapján a két feltárás vörös, *Bositrá*-s mészköve a felső-bajóci Parkinsoni Zónába tartozik. A kőzet és a faunaelemek megtartási állapota alapján a III. feltárásban a középső-jura tenger alatti hasadékban lerakódott üledékanyagként („Q-hasadék", lásd WENDT 1971) azonosítható.



5. ábra. A gyenespusztai V. feltárás földtani szelvénye
1. Alsó-kréta fehér márga, *2.* felső-jura vörös mészkő, *3.* radiolarit, *4.* középső-jura vörös mészkő, *5.* fekete, mangános, alsó-toarci mészkő foszlányok, *6.* alsó-liász dachsteini mészkő

Text-fig. 5. Geological section of Profile V at Gyenespuszta
1. Lower Cretaceous white marl, *2.* Upper Jurassic red limestone, *3.* radiolarite, *4.* Middle Jurassic red limestone, *5.* black, manganiferous Lower Toarcian limestone rags, *6.* Lower Liassic limestone of Dachstein type

V. feltárás

A gyenespusztai majorépülettől É-ra, kb. 600 méterre található kutatóárok tárja fel a legteljesebben a környék mezozóos képződményeit (5. ábra).

A szelvény alján a dachsteini mészkő vastag rétegei láthatók. A dőlés 340°/16°. Egyenetlen felszínén a II. és VI. feltárásban megismert alsó-toarci mangános réteghez igen hasonló foszlányok találhatók, de itt faunát nem sikerült gyűjteni.

A dachsteini mészkőre ammonitico rosso sorozat következik. A kőzetanyag és a benne található mikrofauna megegyezik a II. és VI. szelvény középső-jura kőzeteivel, de itt semmilyen makrofaunát nem tartalmaz. A teljes vastagság mindössze 1 méter.

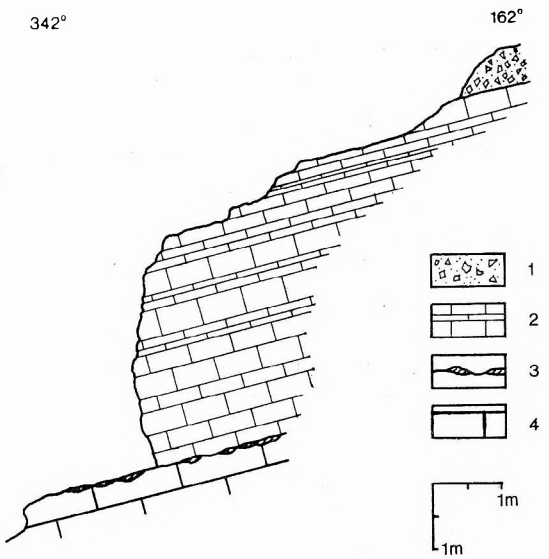
A középső-jura ammonitico rosso mészkőre radiolarit települ, mintegy 6 méter vastagságban. A radiolarit fölött a felső-jura (kimmeridgei—titon) mészkő következik, vastagsága 5—6 méter. A szelvény felső vége az alsó-kréta biancone fáciesű mészmárgát harántolta.

VI. feltárás

A szelvény a gyenespusztai majorépület mögött ÉK—DNY-i irányban futó völgy déli oldalában helyezkedik el. Alsó részén (6. ábra) a hettangi emeletbe sorolható dachsteini mészkő vastag rétegei találhatók. Ennek visszaoldott, egyenetlen felszínén néhány centiméter vastag, erősen mangános mészkő foszlányok találhatók, melyekből gazdag és jómegtartású toarci fauna került elő. Ez a képződmény megegyezik a szomszédos, II. feltárás mangános rétegeivel.

Az egyenetlen felszínre jelentős üledékhézaggal ammonitico rosso mészkő rétegek következnek. A 420 cm vastag sorozat 21 rétegre volt bontható. A három legalsó vörös mészkő rétegből Ammonitesek nem kerültek elő. A felső 18 réteg Ammonitesekben gazdag összlet, melyben a bajóci Stephanoceras humphriesianum Zónától a felső-bath Retrocostatum Zónáig viszonylag teljes rétegsor volt rögzíthető. A középső-jura mészkő összlet erősen kondenzált, minden zóna nem mutatható ki, a szubzónák pedig csak kivételes esetekben azonosíthatók. Mivel a VI. feltárásból kikerült gazdag Ammonites fauna alapján lehetett a terület részletes középső-jura rétegtani tagolását kidolgozni, e szelvény sztratigráfiai vonatkozásait a következő, rétegtani fejezet tárgyalja.

A középső-jura mészkősorozat fedője a radiolarit. A szelvényben a radiolaritnak csak törmelékes, mállott legalsó rétegei vannak meg.



6. ábra. A gyenespusztai VI. feltárás földtani szelvénye

1. Radiolarit-törmelékes talaj, *2.* középső-jura (felső-bajóci—bath) vörös, ammoniteses mészkő, *3.* fekete, mangános alsó-toarci mészkő foszlányok, *4.* alsó-liász dachsteini mészkő

Text-fig. 6. Geological section of Profile VI at Gyenespuszta

1. Soil with radiolarite detritus, *2.* Middle Jurassic (Upper Bajocian to Bathonian) red, ammonitic limestone, *3.* black, manganiferous Lower Toarcian limestone rags, *4.* Lower Liassic limestone of Dachstein type

RÉTEGTANI TAGOLÁS

A gyenespusztai szelvényekből gyűjtött Ammonites fauna alapján kitűnt, hogy a középső-jura emeletei közül a környéken a bajóci és a bath van meg mészköves kifejlődésben. A bajóci emelet felső része a Humphriesianum Zónától a Parkinsoni Zónáig, a bath a Zigzag Zónától a Retrocostatum Zónáig kimutatható. Tekintettel arra, hogy a Humphriesianum Zóna a Bakony hegység több pontján végzett faunagyűjtések eredményeként egységesen feldolgozható, ezen monográfia az ide tartozó faunát nem ismerteti.

A szelvények közül, mint az a fentebbi ismertetésekből is látható, legteljesebb sorozatot és leggazdagabb faunát a VI. feltárás szolgáltatott. Erről a szelvényről a legfontosabb rétegtani és faunisztikai megállapításokat egy előzetes jelentés ismertette (Galácz 1970), így itt csupán a teljesebb faunalista és a részletes rétegtani következtetések közlése indokolt.

Felső-bajóci

Subfurcatum és Garantiana zónák

E két zónába sorolható a szelvény 17. és 16. sz. rétege. A két rétegből a következő Ammonitesek kerültek elő:

Phylloceras trifoliatum Neumayr
P. cf. *trifoliatum* Neumayr
P. isomorphum Gemmellaro
P. cf. *isomorphum* Gemmellaro
P. sp. indet.
Adabofoloceras hajagense n. sp.
A. subobtusum (Kudernatsch)
A. sp. indet.
Calliphylloceras disputabile (Zittel)
C. sp. indet.
Holcophylloceras zignodianum (d'Orbigny)
H. sp. indet.
Lytoceras eudesianum eudesianum (d'Orbigny)
L. eudesianum (d'Orbigny) s. l.

Nannolytoceras polyhelictum (Böckh)
N. cf. *polyhelictum* (Böckh)
Strigoceras truellei (d'Orbigny)
S. sp. indet.
Lissoceras haugi Sturani
L. oolithicum (d'Orbigny)
Oxycerites plicatella (Gemmellaro)
O. sp. indet.
Oecotraustes (Oecotraustes) cf. *costiger* Buckman
Cadomites (Cadomites) deslongchampsi (d'Orbigny)
C. (C.) daubenyi (Gemmellaro)
C. (C.) sp. indet.
C. (Polyplectites) richei Lissajous
Sphaeroceras tenuicostatum tenuicostatum Sturani
S. sp. indet.
Orthogarantiana cf. *bifurcata* (Zieten)
Garantiana (Garantiana) protracta (Bentz)
G. (G.) baculata (Quenstedt)
G. (Hlawiceras) subangulata Wetzel
G. sp. indet.
Caumontisphinctes polygyralis Buckman
Spiroceras bifurcati (Quenstedt)
S. baculatum (Quenstedt)
S. orbignyi (Baugier et Sauzé)
Leptosphinctes (Leptosphinctes) davidsoni (Buckman)
L. (L.) spp. indet.
L. (Cleistosphinctes) cleistus Buckman
Vermisphinctes (Prorsisphinctes) stomphus (Buckman)
V. (P.) pseudofrequens (Siemiradzki)
V. (P.) sp.
V. (P.) spp. indet.
Bigotites (Bigotites) curvatus (Buckman)
B. (B.) lanquinei (Nicolesco)
B. (B.) tuberculatus (Nicolesco)
B. (B.) hodicus (Nikanorova)
B. sp. indet.

Ez a gazdag és változatos fauna csaknem kizárólag a 16. sz. rétegből került elő. A fauna alapján bizonyos, hogy ebben az erősen kondenzált, mindössze 30 cm vastag rétegben a Subfurcatum és a Garantiana Zóna is képviselve van. Sajnos a gyűjtés során nem sikerült ezt a padot tovább bontani, így az egyes fajok pontos rétegtani helyzete nem tisztázható. A faunaelemek közül a *Caumontisphinctes polygyralis*, a *Leptosphinctes (L.) davidsoni* és a *L. (Cleistosphinctes) cleistus* a középső, Polygyralis Szubzónát jelzi, míg a *Garantiana baculata* és a *Spiroceras baculatum* faj a felső, Baculata Szubzónára utal a Subfurcatum Zónán belül (vö. Pavia 1972, Parsons 1976). A 17. sz. réteg, mely sokkal kevesebb értékelhető Ammonites példányt szolgáltatott, minden bizonnyal szintén a Subfurcatum Zóna középső részébe sorolható, mivel az alsó, Banksi Szubzónára jellemző *Stephanoceras* vagy *Teloceras* fajok nincsenek képviselve.

A 16. sz. rétegben Subfurcatum Zónára jellemző elemek mellett megtalálhatók a Garantiana Zóna jellegzetes alakjai is. Ezek a *Hlawiceras*, egyes *Spiroceras* és *Bigotites* fajok. A *Hlawiceras* a középső, Trauthi Szubzónára, a *Bigotites*-ek a felső, Tetragona Szubzónára utalnak (vö. Pavia 1972).

Parkinsoni Zóna

A bajóci emelet legfelső zónájába a gyenespusztai VI. szelvény 15., 14. és 13. sz. rétege sorolható összesen 77 cm vastagságban. A zóna három szubzónáját nem lehetett pontosan azonosítani. A 15. sz. rétegből a következő Ammonitesek kerültek elő:

Phylloceras trifoliatum Neumayr
P. isomorphum Gemmellaro
P. sp. indet.
Adabofoloceras subobtusum (Kudernatsch)
A. sp. indet.
Calliphylloceras disputabile (Zittel)
C. cf. *disputabile* (Zittel)
Holcophylloceras zignodianum (d'Orbigny)
H. sp. indet.
Lytoceras eudesianum (d'Orbigny) s. l.
L. sp. indet.
Nannolytoceras polyhelictum (Böckh)
Strigoceras truellei (d'Orbigny)
Lissoceras oolithicum (d'Orbigny)

Oxycerites plicatella (GEMMELLARO)
O. sp. indet.
Cadomites (Cadomites) deslongchampsi (D'ORBIGNY)
C. (C.) daubenyi (GEMMELLARO)
C. (C.) orbignyi DE GROSSOUVRE
C. (C.) sturanii n. sp.
C. (C.) sp. indet.
Garantiana (Hlawiceras) alticosta WETZEL
Parkinsonia (Parkinsonia) rarecostata (BUCKMAN)
P. (P.) sp.
Dimorphinites (Dimorphinites) dimorphus (D'ORBIGNY)
D. (subgenus?) *defrancii* (D'ORBIGNY)
Vermisphinctes (Vermisphinctes) martinsi (D'ORBIGNY)
V. (Prorsisphinctes) leederi (TRAUTH)
V. (P.) hoffmanni (GEMMELLARO)
V. spp. indet.
Bigotites (Bigotites) bajociensis (SIEMIRADZKI)

Ez az együttes, elsősorban a számos *Vermisphinctes* faj, valamint a *Parkinsoniá*-k alapján inkább a Parkinsoni Zóna középső részének tűnik. Nem kizárt azonban, hogy kondenzálva képviseli a Parkinsoni Zóna alsó, Acris Szubzónáját is.

A 14. sz. réteg az előbbinél szegényebb és kevésbé jellemző faunát szolgáltatott:

Phylloceras trifoliatum NEUMAYR
P. isomorphum GEMMELLARO
P. kunthi NEUMAYR
P. sp. indet.
Calliphylloceras disputabile (ZITTEL)
Holcophylloceras zignodianum (D'ORBIGNY)
H. sp. indet.
Ptychophylloceras triplicatum n. sp.
Lytoceras eudesianum (D'ORBIGNY) s. l.
L. adelae (D'ORBIGNY)
Oxycerites plicatella (GEMMELLARO)
Cadomites sp. indet.
Parkinsonia (Parkinsonia) sp. indet.
Dimorphinites (Dimorphinites) dimorphus (D'ORBIGNY)
D. (D.) sp. indet.

Ez a fauna szubzóna szinten nem azonosítható, de inkább a Parkinsoni Zóna felső részéhez áll közel, elsősorban azért, mert itt már megjelenik a *Phylloceras kunthi* néhány és a *Ptychophylloceras triplicatum* n. sp. egy példánya, mely fajok nagyobb számban a felette levő 13. sz. rétegben fordultak elő.

A Parkinsoni Zóna felső részébe tartozó 13. sz. rétegből a következő fauna került begyűjtésre:

Phylloceras trifoliatum NEUMAYR
P. isomorphum GEMMELLARO
P. kunthi NEUMAYR
P. sp. indet.
Adabofoloceras subobtusum (KUDERNATSCH)
A. abichi (UHLIG)
Calliphylloceras disputabile (ZITTEL)
C. cf. *disputabile* (ZITTEL)
Holcophylloceras zignodianum (D'ORBIGNY)
H. sp. indet.
Ptychophylloceras triplicatum n. sp.
P. sp. indet.
Lytoceras eudesianum (D'ORBIGNY) s. l.
L. adelae (D'ORBIGNY)
L. sp. indet.
Nannolytoceras polyhelictum (BÖCKH)
N. tripartitum (RASPAIL)
N. sp. indet.
Lissoceras oolithicum (D'ORBIGNY)
L. sp. indet.
Oppelia cf. *flexa* (BUCKMAN)
O. sp. indet.
Oecotraustes (Oecotraustes) costiger BUCKMAN
Cadomites (Cadomites) deslongchampsi (D'ORBIGNY)
C. (C.) daubenyi (GEMMELLARO)
C. (C.) rectelobatus (HAUER)
C. (C.) sp. indet.
C. (Polyplectites) venetus (PARONA)
Parkinsonia (Parkinsonia) parkinsoni (SOWERBY)
Dimorphinites (Dimorphinites) dimorphus (D'ORBIGNY)

D. (D.) compressus n. sp.
D. (D.) sp. indet.
Vermisphinctes (Prorsisphinctes) venetus STURANI
V. (P.) cf. *limnioticus* (BUCKMAN)
V. (P.) spp. indet.

Ebben a rétegben, mely valószínűleg megfelel a Bomfordi Szubzónának, a legfeltűnőbb a *Dimorphinites* fajok, azon belül is a *D. dimorphus* gyakorisága.

Alsó-bath

Zigzag Zóna

Összehasonlítva a bajóci rétegekkel, a szelvény bath rétegeiből igen gyér, és rétegtanilag döntő Ammonites fajokban nagyon szegény fauna került elő. Így a zóna azonosítása sok tekintetben bizonytalan, az egyes szubzónák kijelölése pedig lehetetlen. Az bizonyos, hogy a 12—9. sz. rétegek (összvastagság 73 cm) az alsó-bath Zigzag Zónát képviselik. Ezekből a rétegekből az alábbi Ammonitesek kerültek elő:

Phylloceras isomorphum (GEMMELLARO)
P. kudernatschi (HAUER)
P. sp. indet.
Adabofoloceras subobtusum (KUDERNATSCH)
Calliphylloceras disputabile (ZITTEL)
C. cf. *disputabile* (ZITTEL)
Holcophylloceras zignodianum (D'ORBIGNY)
H. sp. indet.
Ptychophylloceras flabellatum (NEUMAYR)
P. sp. indet.
Lytoceras eudesianum (D'OBRIGNY) s. l.
L. adelae (D'ORBIGNY)
L. sp. indet.
Nannolytoceras tripartitum (RASPAIL)
N. sp. indet.
Lissoceras psilodiscus (SCHLOENBACH)
L. magnum n. sp.
L. sp. indet.
Oxycerites sp. indet.
Cadomites (Cadomites) cf. *deslongchampsi* (D'ORBIGNY)
C. (C.) cf. *rectelobatus* (HAUER)
C. (C.) sp. indet.
C. (Polyplectites) zlatarskii STEPHANOV
Parkinsonia (Parkinsonia) cf. *subtilis* ARKELL
Parapatoceras sp.
Procerites cf. *clausiprocerus* (BUCKMAN)
P. sp. indet.
?Zigzagiceras (?Zigzagiceras) sp. indet.
Z. (Procerozigzag) pseudoprocerum (BUCKMAN)
Z. (P.) postpollubrum (WETZEL)
Choffatia (Subgrossouvria) sp. aff. *rakotondramazavai* COLLIGNON

Az egyes rétegtanilag értékelhető fajok a Zigzag Zónán belül másutt megállapított sorrendben következnek; a *Procerites* és *Zigzagiceras* fajok a 10. sz. és a 11. sz. rétegből származnak, így a Zigzag Zóna közepére utalnak. Valószínű, hogy a jellemző, Macrescens Szubzónát bizonyító faunaelemek (bath Morphoceratidae-k és Parkinsoniidae-k) hiányában a Zigzag Zóna alsó része nem mutatható ki. A Zigzag Zóna felső része hiányzik.

Középső-bath

Progracilis Zóna

Ide tartozik a 8. sz. réteg, melyből a következő fauna került ki:

Phylloceras kudernatschi (HAUER)
P. sp. indet.
Calliphylloceras disputabile (ZITTEL)
C. cf. *disputabile* (ZITTEL)
Holcophylloceras zignodianum (D'ORBIGNY)
H. sp. indet.
Ptychophylloceras flabellatum (NEUMAYR)
P. sp. indet.
Lytoceras eudesianum (D'ORBIGNY) s. l.
Nannolytoceras cf. *tripartitum* (RASPAIL)
Lissoceras psilodiscus (SCHLOENBACH)

L. magnum n. sp.
L. ferrifex (ZITTEL)
Oxycerites cf. *oxus* (BUCKMAN)
O. sp. indet.
Cadomites (Cadomites) sp. indet.
Wagnericeras (Suspensites) suspensum BUCKMAN
Choffatia (Subgrossouvria) sp. aff. *rakotondramazavai* COLLIGNON

Ebben a faunában az *Oxycerites* cf. *oxus* és a *Suspensites suspensum* előfordulása a Progracilis Zónára utal.

Subcontractus Zóna

A gyenespusztai VI. szelvény legvastagabb (82 cm) zónája, mely a 7—2. sz. rétegeket foglalja magába. Viszonylag gazdag faunát szolgáltatott:

Phylloceras kudernatschi (HAUER)
P. cf. *kudernatschi* (HAUER)
P. sp. indet.
Calliphylloceras disputabile (ZITTEL)
C. cf. *disputabile* (ZITTEL)
Holcophylloceras zignodianum (D'ORBIGNY)
H. sp. indet.
Ptychophylloceras flabellatum (NEUMAYR)
P. sp. indet.
Lytoceras eudesianum (D'ORBIGNY) s. l.
L. sp. indet.
Lissoceras ferrifex (ZITTEL)
L. sp. indet.
Oxycerites spp. indet.
Prohecticoceras ochraceum ochraceum ELMI
Cadomites (Cadomites) rectelobatus (HAUER)
C. (C.) exstinctus (QUENSTEDT)
C. (C.) sp. indet.
Tulites (Rugiferites) serpenticonus (ARKELL)
T. (R.) sp. indet.
Bullatimorphites eszterense (BÖCKH)
B. spp. indet.
Wagnericeras (Wagnericeras) subfurcula (LISSAJOUS)
W. (Suspensites) suspensum BUCKMAN
Choffatia (?Homoeoplanulites) sp. indet.
C. (Subgrossouvria) uriniacensis (LISSAJOUS)
C. (S.) sp. aff. *rakotondramazavai* COLLIGNON

Ebben a faunában nehéz további finomrétegtani bontást elvégezni, csupán annyi látható, hogy az alsó részen (6—7. sz. rétegek) a *Suspensites suspensum* és a *Subgrossouvria uriniacensis*, a felsőbb részen (5—2. sz. rétegek) a *Rugiferites* és *Bullatimorphites* fajok, valamint a *Prohecticoceras o. ochraceum* jellemző. Megjegyzendő, hogy a közeli, II. szelvényben a rétegtanilag értékelhető faunaelemek hasonló sorrendben fordultak elő.

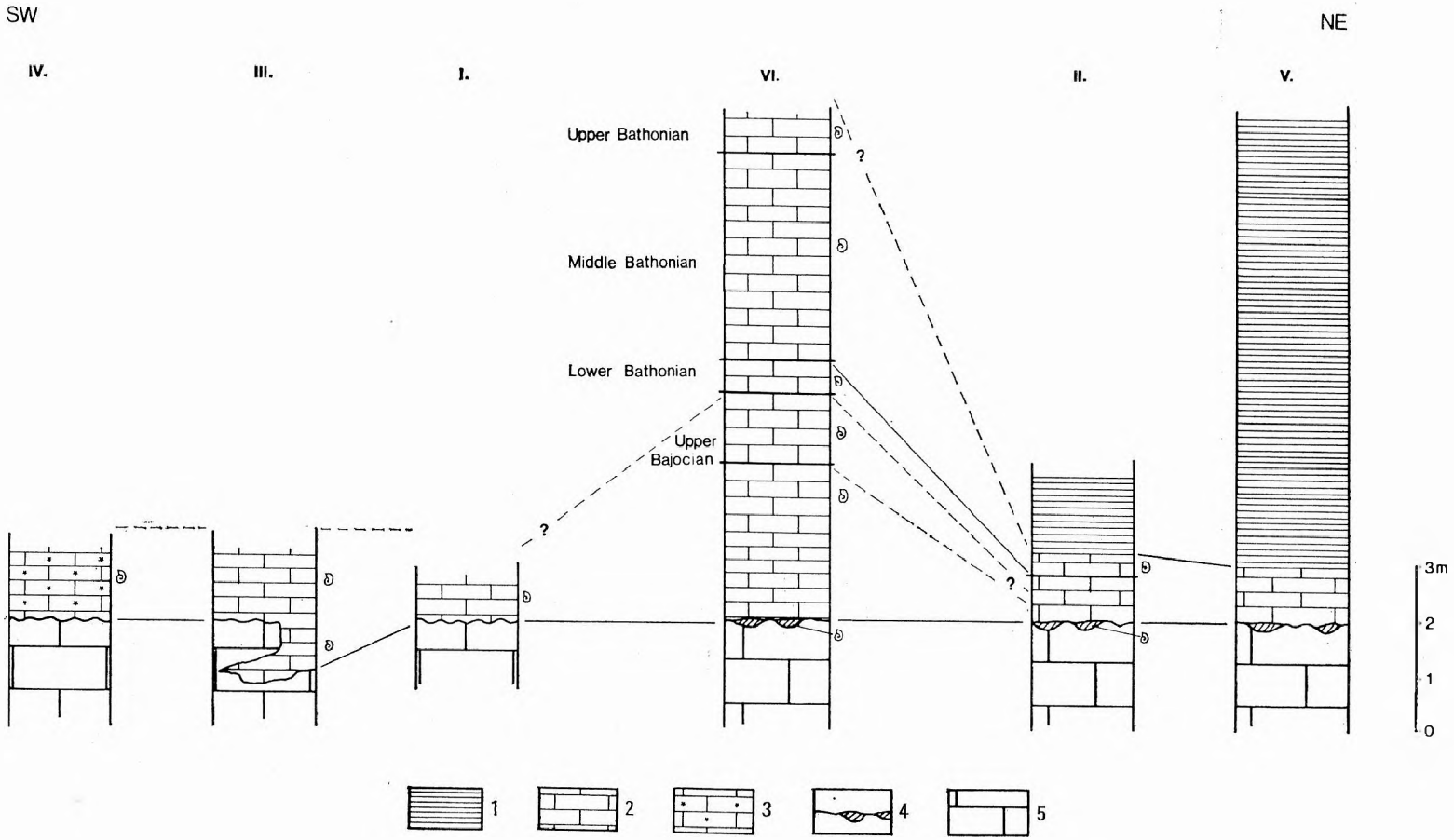
A középső-bath felső, Morrisi Zónáját nem sikerült azonosítani a zónára jellemző Ammonitesek hiánya miatt.

Felső-bath

Retrocostatum Zóna

A VI. szelvény legfelső mészkő rétege jellegzetes faunát szolgáltatott:

Phylloceras kudernatschi (HAUER)
P. cf. *kudernatschi* (HAUER)
P. sp. indet.
Calliphylloceras disputabile (ZITTEL)
C. cf. *disputabile* (ZITTEL)
Holcophylloceras zignodianum (D'ORBIGNY)
H. sp. indet.
Ptychophylloceras flabellatum (NEUMAYR)
P. sp. indet.
Lytoceras eudesianum (D'ORBIGNY) s. l.
Lissoceras ferrifex (ZITTEL)
Oxycerites sp. indet.
Cadomites (Cadomites) rectelobatus (HAUER)
Bullatimorphites stephanovi n. sp.
B. sp.
B. sp. indet.



7. ábra. A Gyenespuszta környéki középső-jura szelvények biosztratigráfiai korrelációja

1. Radiolarit, *2.* középső-jura vörös mészkő, *3.* középső-jura crinoideás mészkő, *4.* alsó-toarci mangános mészkő foszlányok, *5.* alsó-jura dachsteini mészkő

Text-fig. 7. Biostratigraphic correlation of the Middle Jurassic profiles near Gyenespuszta

1. Radiolarite, *2.* Middle Jurassic red limestone, *3.* Middle Jurassic crinoidal limestone, *4.* Lower Toarcian manganiferous limestone rags, *5.* Lower Jurassic Dachstein-type limestone

Procerites cf. *hodsoni* ARKELL
P. sp. indet.
Wagnericeras (Suspensites) sp. aff. *arbustigerum* (D'ORBIGNY)
Choffatia (Choffatia) subbakeriae (D'ORBIGNY)
C. (C.) densidecorata n. sp.
C. (C.) spp. indet.

Ez a fauna kétségkívül a Retrocostatum Zóna alsó részét jelzi, a jellegzetes *Procerites* és *Choffatia* fajokkal (= „nagy Perisphinctidae-k faunája", lásd TORRENS 1967).

A GYENESPUSZTAI KÖZÉPSŐ-JURA SZELVÉNYEK BIOSZTRATIGRÁFIAI KORRELÁCIÓJA

A Gyenespuszta környékén feltárt 6, középső-jura képződményeket harántoló szelvény faunisztikailag, illetve litológiailag jól párhuzamosítható (7. ábra). Valamennyi szelvényben a hettangi dachsteini mészkő egyenetlen felszínére, lényeges üledékhézaggal települnek a középső-jura ammonitico rosso rétegek. A II., V. és VI. szelvényben a két képződmény között epizodikus toarci szedimentáció visszaoldásos maradványai találhatók. A fedő radiolarit képződésének megindulása Gyenespuszta környékén, a II. és a VI. szelvény tanúsága szerint, a felső-bath Retrocostatum Zóna magasabb részében rögzíthető.

ŐSLÉNYTANI RÉSZ

A GYENESPUSZTAI AMMONITES FAUNA ÁLTALÁNOS JELLEGEI

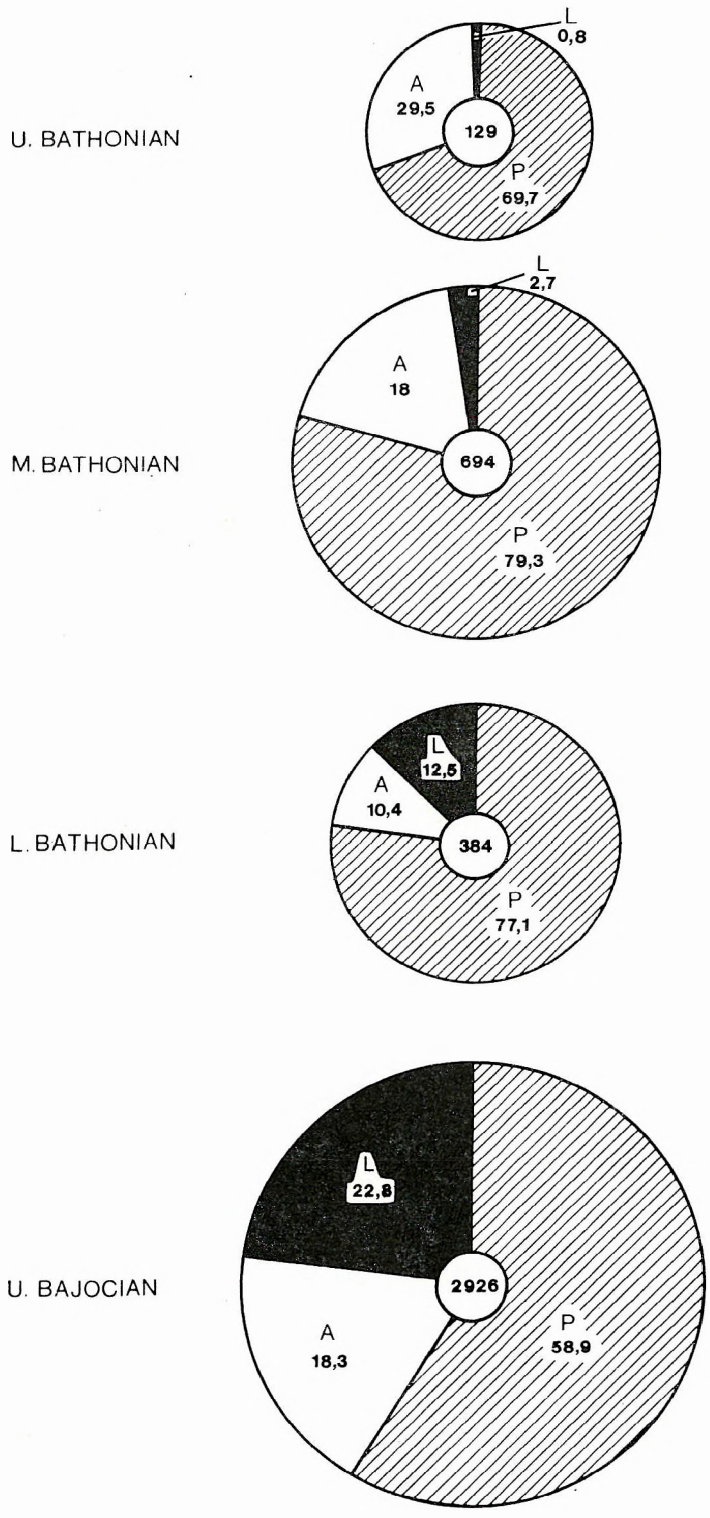
A gyenespusztai középső-jura szelvények közül részletes makrofauna elemzést az ammonitico rossot feltárt II. és VI. szelvény anyagából lehetett végezni. A fauna megfelel a jellemző Tethys-i vörös gumós mészkövek faunájának, amennyiben Ammoniteseken kívül más faunaelemeket alig tartalmaz. A II. feltárásból egy Belemnites rostrumot, a VI. feltárásból néhány pszeudoplanktonikus *Inoceramus*-t, egy Nautilidát és néhány Belemnites rostrumot gyűjtöttek. A rendkívül ritka bentonikus makrofaunát néhány Pleurotomariida csiga, valamint egy-két Brachiopoda és irreguláris tengeri sün képviselte.

A makrofauna túlnyomó többségét az Ammonitesek képezik. A faunisztikai és sztratigráfiai szempontból legfontosabb VI. szelvény Ammoniteseit rétegről rétegre gyűjtötték, pontosan rögzítve a rétegvastagságot és a begyűjtésre került felületet. Ez utóbbi a szelvény felső, faunában szegényebb részén általában 5, alsó, faunadúsabb részén 2,8 m^2 volt. A pontosan dokumentált gyűjtés lehetővé tette az Ammonites fauna részletes mennyiségi kiértékelését. Ennek eredményeit korábbi cikk ismertette (GALÁCZ 1970), így itt csupán a fontosabb összesítő adatok közlése indokolt.

Az Ammonites fauna számszerű összetétele tipikus Tethys-i jellegeket mutat. A szelvényben végig jellemző a *Phylloceras*- és *Lytoceras*-félék túlsúlya. Alemelet-bontásban ezt a 8. ábra mutatja. A fedő radiolarit felé haladva egyrészt jellemző a fauna általános elszegényedése (példányszám-csökkenés), másrészt az Ammonitinák részarányának csökkenése. Ez utóbbi tendenciát más Bakony hegységi jura Ammonites faunákban is megfigyelték (KONDA 1970, GÉCZY 1971).

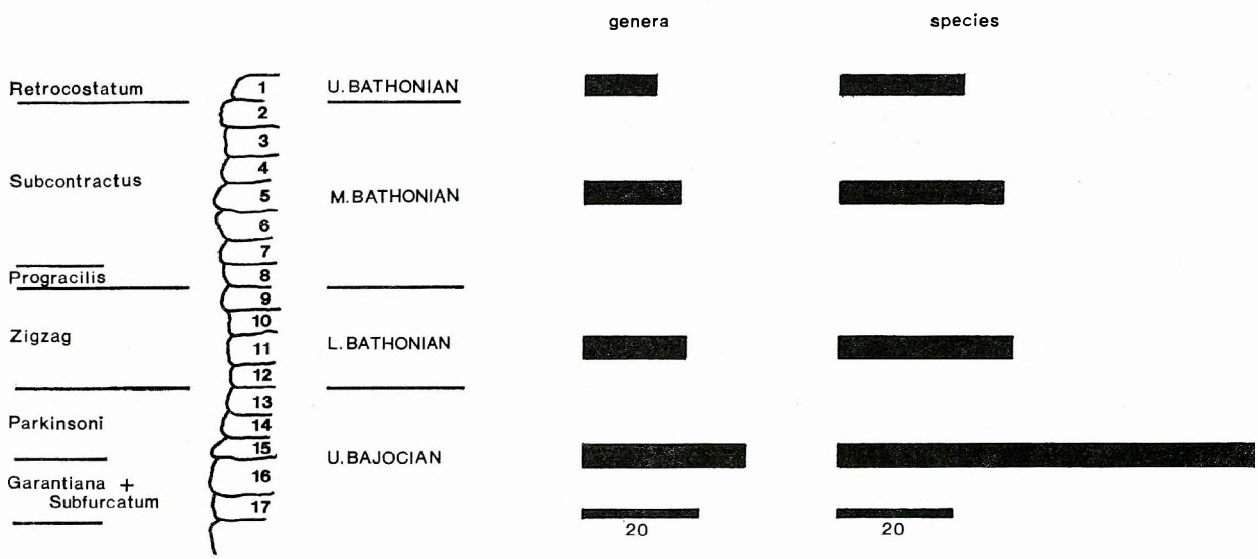
Az Ammonites fauna diverzitásának értékelése alapján szintén tipikus Tethys-i jellegek rajzolódnak ki. A szelvényben végig igen magas genus- és faj-diverzitás mutatkozik. FÜRSICH és SYKES (1977) oxfordi Ammoniteseken végzett vizsgálatai alapján a 10-en felüli generikus diverzitás értékek már Tethys-i jellegnek tekinthetők. A gyenespusztai faunában felismerhető magas diverzitás értékek felfelé haladva csökkenő tendenciát mutatnak (9. ábra). Ez a csökkenés egyformán mutatkozik a generikus és faj-diverzitásban, és együtt jár a példányszám már említett csökkenő tendenciájával. ARKELL (1951—59, p. 1) felhívta a figyelmet arra, hogy a bath Ammonites faunák általános elszegényedést mutatnak. A gyenespusztai Ammonitesek mennyiségi vizsgálata arra utal, hogy ez a tendencia Tethys-i faunákban is kimutatható.

Az Ammonites genusok elterjedése alapján paleogeográfiai jellemzőkre derül fény. HALLAM (1975, p. 202) összefoglalása szerint a *Phylloceras*- és *Lytoceras*-félék mellett a Haploceratidae, Oppeliidae, Sphaeroceratidae, Clydoniceratidae, Tulitidae, Leptosphinctinae, Morphoceratidae és Zigzagiceratinae családok és alcsaládok jellegzetesen Tethys-i elterjedést mutatnak. Ez a felsorolás kiegészíthető a túlnyomórészt Tethys-i előfordulású dogger heteromorphokkal (DIETL 1973) és egyes felső-bajóci—bath Stephanoceratidaekkel (*Cadomites, Polyplectites*, lásd THIERRY 1976). Ugyancsak dominánsan Tethys-i előfordulásban jelentkeznek a Parkinsoniidae és Pseudoperisphinctinae genusok.



8. ábra. A gyenespusztai VI. szelvényből rétegenként gyűjtött Ammonites fauna mennyiségi összetétele alemelet, illetve alrend bontásban

Text-fig. 8. Quantitative composition of the ammonite fauna sampled layer by layer from Profile VI at Gyenespuszta as distributed by substages and suborders



9. ábra. A gyenespusztai VI. szelvényből gyűjtött Ammonites fauna diverzitásának változása alemeletenként
Text-fig. 9. Variation by substages in the diversity of the ammonite fauna from Profile VI at Gyenespuszta

A gyenespusztai felső-bajóci és bath Ammonitesek kivétel nélkül besorolhatók ezekbe a magasabb taxonokba. Az itteni fauna tehát tipikus Tethys-i Ammonites együttes. Úgy tűnik azonban, hogy alacsonyabb rendszertani szinteken (főleg genus szinten) további provincialitás mutatható ki.

Cariou (1973) a felső-jura Ammonitesek elterjedése alapján nemcsak pontosabban körvonalazta a boreális és Tethys-i provinciák közötti különbségeket, de szubprovinciákat is kimutatott (lásd még Fürsich és Sykes 1977). Úgy tűnik, ezek a paleobiogeográfiai egységek már a bajóciban, de különösen a bathban felismerhetők. A bajóciban és a bathban a szűkebb értelemben vett Tethys-i provincia területén elsősorban a *Phylloceras*- és *Lytoceras*-félék túlsúlya jellemző, míg az ÉNy-Európa területére eső szubmediterrán és szubboreális szubprovinciákat olyan genusok megléte jellemzi, melyek a mediterrán területeken hiányzanak.

Gyenespuszta a faunaösszetétel alapján a szűkebb értelemben vett Tethys-i provinciába tartozik. A túlnyomórészt *Phylloceras*- és *Lytoceras*-félékből álló faunából hiányzanak a szubboreális és szubmediterrán provinciákra jellemző *Clydoniceras*-ok, *Morphoceras*-félék (kivéve a *Dimorphinites*-t), a *Parkinsoniá*-k pedig igen alárendeltek.

A bajóci és bath Ammonites faunák paleobiogeográfiai analízise további munkát igényel, mely kívül esik e monográfia hatáskörén. A leíró részben mindazonáltal valamennyi részletesen tárgyalt genusnál megtalálhatók a földrajzi elterjedésre vonatkozó adatok. Mivel a szubboreális és szubmediterrán területek szétválasztása a bajóci és bath emeletek vonatkozásában még nem pontos, ezeket az egységeket összesítve ÉNy-európai provinciaként említettem.

SZEXUÁLIS DIMORFIZMUS

Olyan tekintélyes nagyságú Ammonites-anyag feldolgozásánál, mint amilyen az itt leírt gyenespusztai fauna, szót kell ejteni az Ammonites paleobiológia egyik problémaköréről, a szexuális dimorfizmus kérdéséről. Az 1960-as években több alapvető munka foglalkozott ezzel részletesen (lásd Callomon 1963, Makowski 1963, Westermann 1964 stb.). Az összefoglaló munkák mellett igen sok cikk és monográfia közölt megfigyeléseket egyes Ammonites-csoportok dimorfizmusáról. A fosszilis Cephalopodákról készült legújabb összefoglaló munkák (pl. Lehmann 1976, Kennedy és Cobban 1976) az Ammonitesek szexuális dimorfizmusát mint kétségtelen tényt említik.

A gyenespusztai Ammonites fauna azonban ismét felveti azokat a kételyeket, melyek az Ammonitesek dimorfizmusának szexuális jellege ellen hozhatók fel.

1. Mindezideig nem sikerült dimorfizmust kimutatni a legjellegzetesebb és tömegesen előforduló Tethys-i csoportoknál, a jura *Phylloceras*- és *Lytoceras*-félék körében. Az egyes *Phylloceras*-félék dimorfizmusáról közölt adatok (pl. legújabban Joly 1976) nem meggyőzőek (lásd a rendszertani részben).

1. táblázat — Table 1

Alsó-bajóci és bath standard zónák és szubzónák (Sturani 1966, Torrens 1967 és Parsons 1976 alapján)
The standard zones and subzones of the Upper Bajocian and the Bathonian (after Sturani 1966, Torrens 1967 and Parsons 1976)

	Zones	Subzones
Bathonian	Discus	Clydoniceras discus
		Clydoniceras hollandi
	Retrocostatum	
	Morrisi	
	Subcontractus	
	Progracilis	
	Zigzag	Oxycerites yeovilensis
		Morphoceras macrescens
		Parkinsonia convergens
Bajocian	Parkinsoni	Parkinsonia bomfordi
		Parkinsonia densicostata
		Parkinsonia acris
	Garantiana	Hlawiceras tetragona
		Hlawiceras trauthi
		Pseudogarantiana dichotoma
	Subfurcatum	Garantiana baculata
		Caumontisphinctes polygyralis
		Teloceras banksi
	Humphriesianum	

2. A középső-jura Ammonitesek körében felállított szexuális dimorf párok az esetek többségében rétegtanilag különböző genusokat egyesítenek.

Az irodalom alapján táblázatba foglaltam a Gyenespusztán előforduló bajóci és bath Ammonites genusokat, és azok ismertetett dimorf párjait. A táblázatból (2. táblázat) magától értetődő módon kihagytam a dimorfizmust nem mutató Phylloceratina és Lytoceratina csoportokat. Számos Ammonitina genustól is el kellett tekinteni (pl. *Parkinsonia*, Spiroceratidae), mivel ezek körében sem sikerült eddig a dimorf párok kimutatása. Látható, hogy a legbiztosabban dimorfnak tartott párok (pl. *Strigoceras—Cadomoceras*, *Cadomites—Polyplectites*, *Leptosphinctes—Cleistosphinctes*) is feltűnő különbségeket mutatnak a vertikális elterjedésben. Lehet azzal érvelni, hogy további leletek az egyes, főképp microconch (sub)genusok rétegtani elterjedését ki fogják terjeszteni. Néhány esetben (pl. *Microlissoceras*, lásd p. 56.) ez lehetséges, más esetben (pl. *Cadomoceras*) aligha várható. Lehmann (1976, p. 78) és mások is az egyes dimorf párok elterjedési különbségeit fácies-váltásokkal magyarázzák. Ez a magyarázat abból a következtetésből indul ki, hogy a különböző nemű Ammonitesek különböző ökológiai zugokat népesítettek be (lásd pl. Sturani 1971).

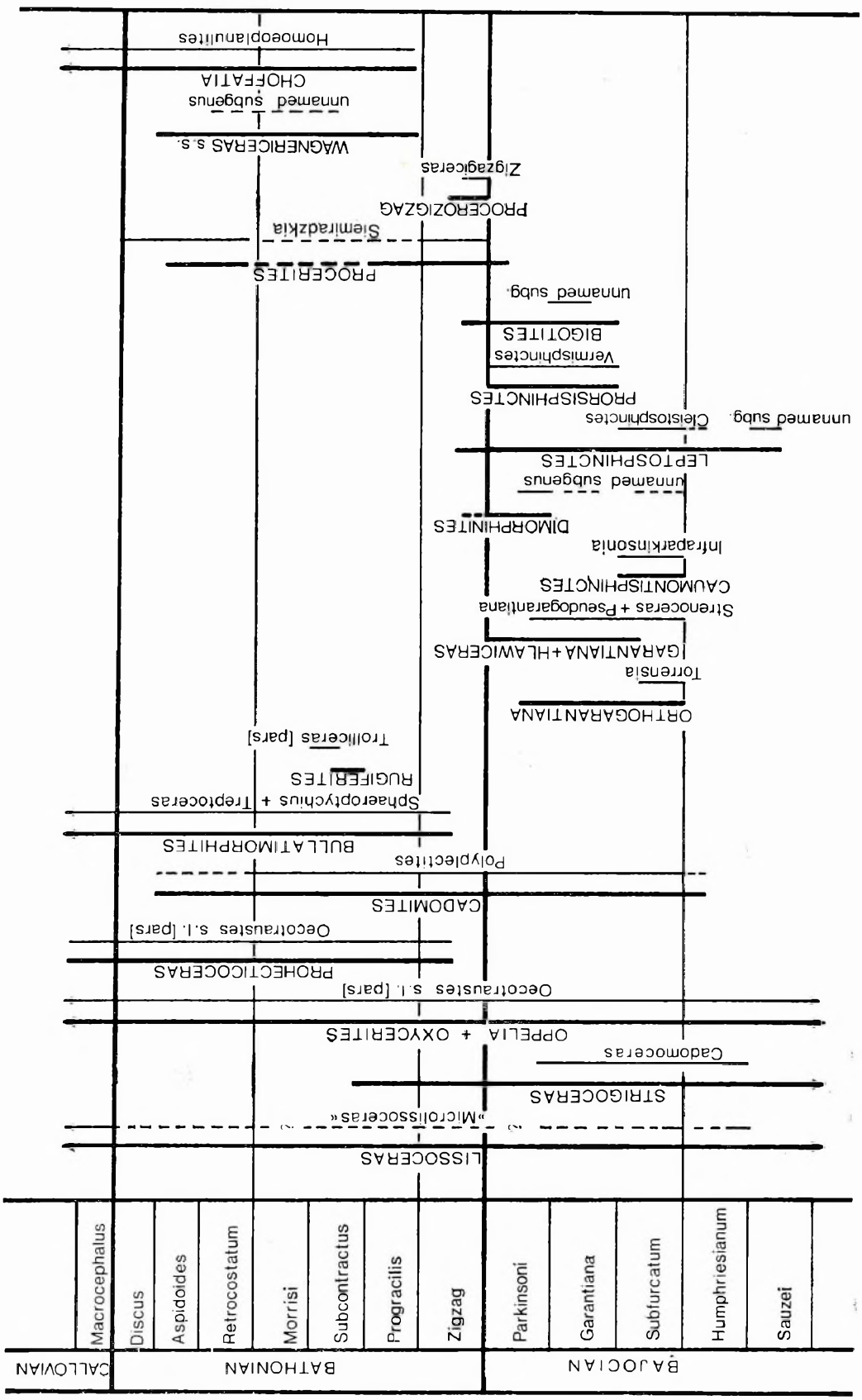
A gyenespusztai leggazdagabb faunát szolgáltató VI. szelvény rétegei végig azonos fáciesben képződtek. Éppen ezért érdekes lehet a 2. táblázatnak olyan változata (3. táblázat), mely a gyenespusztai leletek alapján mutatja be az itt előfordult dimorf párokat. A táblázatból kitűnik, hogy a már korábban jelzett (Galácz 1970, p. 126) microconch-hiány igen élesen jelentkezik. Teljesen hiányoznak a Haploceratidae, Hecticoceratinae és Parkinsoniidae microconchok, s a *Cadomites*, *Dimorphinites* és egyes Perisphinctidae macroconch genusok microconch párjai is egészen ritkák, bár jelen vannak. Ebből következik, hogy nem fácies okok (vagyis őskörnyezeti változások), hanem inkább véletlenszerű tényezők befolyásolják a microconch alakok megjelenését vagy hiányát, illetve az, hogy az egyes (sub)genusok vertikális elterjedésében tapasztalt különbségek nem látszólagosak, hanem nagyrészt valósak.

A fenti kétségek alapján nem látszik indokoltnak Ammonitesek szexuális dimorfizmusáról beszélni. Kétségtelen azonban, hogy egyes genusok korai egyedfejlődése közel egyező, a felnőtt példányok pedig törvényszerűen megfelelnek egymásnak. Ezért egyes csoportok dimorfizmusa vitathatatlan. Mivel az Ammonitesek, e kihalt csoport rendszere a morfológia alapján áll, jogos e morfológiai hasonlóságokat taxonómiai megjelenítésben is kifejezni. Erre legjobb eljárás a Callomon (1963)-tól ajánlott macroconch—microconch subgenerikus besorolás. A paleontológiai leírásoknál a dimorf genusokat ilyen összefüggésben tárgyaltam, s minden egyes (sub)genusnál részletesen kitértem az alakok dimorfizmusára.

2. táblázat — Table 2

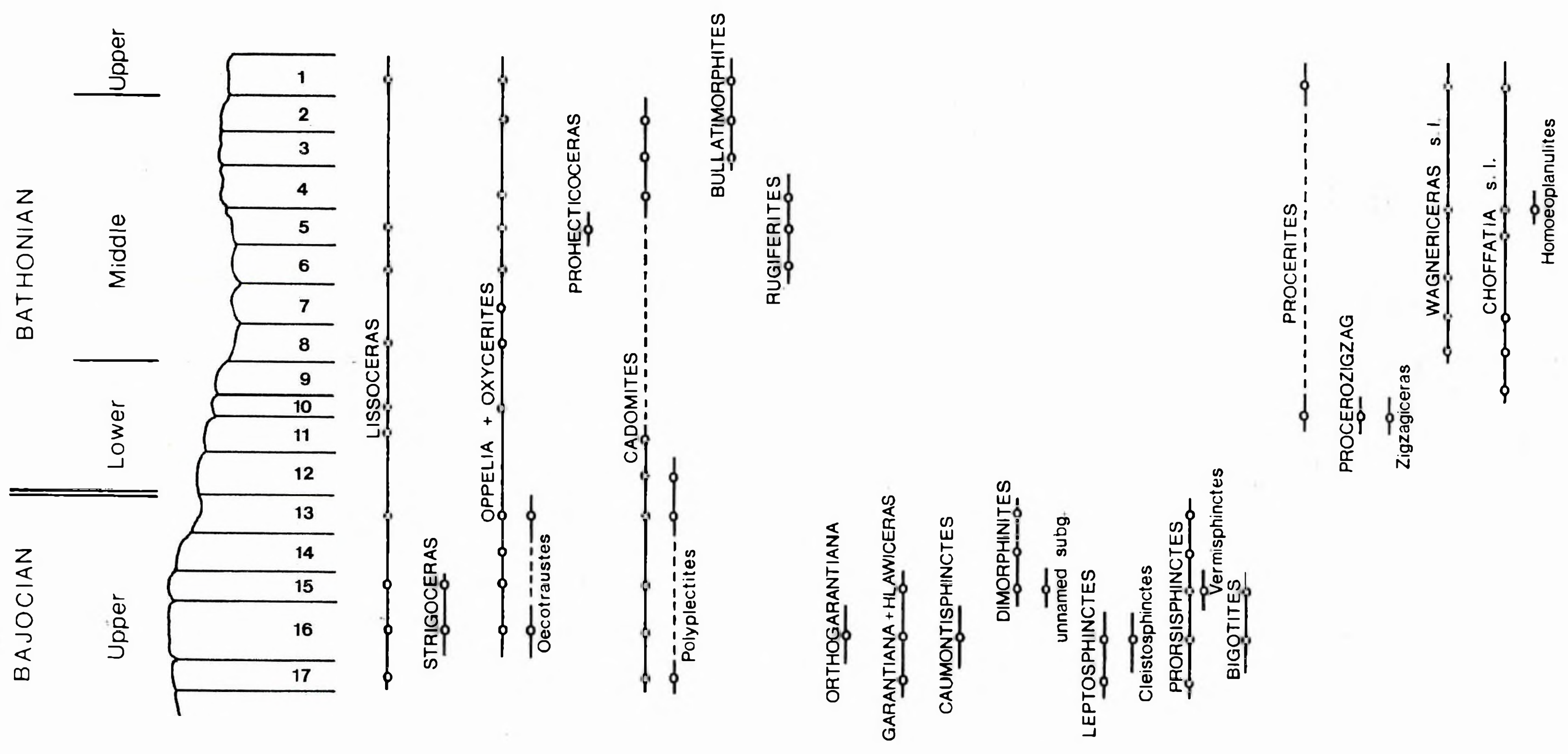
A gyenespusztai szelvényekben is meglevő, dimorfizmust mutató felső-bajóci és bath Ammonitesek macroconch és microconch szubgenuszainak rétegtani elterjedése. Összeállítás irodalmi adatok alapján

Upper Bajocian and Bathonian stratigraphic distribution of the microconchiate and macroconchiate ammonite subgenera. Compilation from the literature



3. táblázat — Table 3

A Gyenespusztán talált bajóci és bath dimorf Ammonitesek rétegtani elterjedése a VI. szelvényben
Stratigraphic distribution of the Bajocian and Bathonian dimorph ammonites as found in the Profile VI of Gyenespuszta



MACROCONCHS; Microconchs

MIDDLE JURASSIC PROFILES IN THE VICINITY OF GYENESPUSZTA

To explore the Middle Jurassic sediments available (Text-fig. 2), the staff of the Hungarian Geological Institute carried out diggings on six sites in the vicinity of Gyenespuszta farmstead, northern Bakony Mountains, Hungary (Text-fig. 1). Each profile thus exposed comprises a different rock sequence of different facies and with a different fauna. (For the faunal lists and the profiles, see the Hungarian text.)

Profile I

The Dachstein Limestone is overlain with a hiatus spanning the entire Middle and Upper Liassic and the Lower Dogger, by red nodular limestone beds (Text-fig. 3), with a fauna characteristic of the Upper Bajocian Parkinsonia parkinsoni Zone.

Profile II

At the base of the profile (Text-fig. 4) the footwall is represented by lowermost Liassic limestones of Dachstein type that are followed by a thin manganiferous layer with ammonites characteristic of the Toarcian Hildaites serpentinum Zone. This is overlain by the Middle Jurassic ammonitico rosso limestone in which the Middle Bathonian Tulites subcontractus Zone and the Upper Bathonian Prohecticoceras retrocostatus Zone could be identified. The hanging-wall is represented by radiolarites.

Profiles III and IV

The two profiles have exposed a Middle Jurassic rock suit of similar litho- and biofacies, differing from the other Gyenespuszta profiles. The abundance of *Bositra* is conspicuous. Both lithology and fauna suggest the presence in Profile III of sediments deposited in a submarine fissure (Q fissure, see WENDT 1971). Both profiles contain a fauna belonging to the Parkinsoni Zone.

Profile V

The rock types in this profile (Text-fig. 5) agree with those of the other Gyenespuszta sections, but neither the Toarcian ferromanganese limestone rags, nor the about 1 m of Middle Jurassic red limestone have yielded any macrofauna.

Profile VI

Most complete of all the Middle Jurassic profiles at Gyenespuszta, the rock sequence (Text-fig. 6) begins, here too, with the lowermost Liassic Dachstein-type limestone. On the rough, subsoluted surface of this limestone there are heavily manganized limestone rags about a few cm thick, of which a rich and well-preserved Toarcian fauna has been recovered. This formation corresponds to the manganiferous bed of Profile II.

The rough surface is overlain, with a considerable break in sedimentation, by ammonitico rosso limestones, forming a 420-cm-thick suit, with a total of 21 beds identified. The three basal red lime-

stone beds have yielded no ammonite. The 18 beds above them, however, abound with them, so that a relatively complete stratigraphic sequence from the Bajocian Stephanoceras humphriesianum Zone up to the Upper Bathonian Prohecticoceras retrocostatum Zone could be identified. The Middle Jurassic limestone sequence is heavily condensed; not all the zones are identifiable, the subzones being so just in exceptional cases. Since the detailed Middle Jurassic stratigraphy of the study area has been based on the rich ammonite fauna from Profile VI, the stratigraphic implications of this section are set forth in the following, stratigraphic, chapter.

STRATIGRAPHIC SUBDIVISION

As shown by the ammonite fauna from the Gyenespuszta profiles, the Bajocian and the Bathonian are the only Middle Jurassic stages available in limestone facies in the study area. The upper part of the Bajocian can be shown to occur from the Humphriesianum Zone to the Parkinsoni Zone, the Bathonian from the Zigzag Zone to the Retrocostatum Zone. Curiously enough, Gyenespuszta has so far been the only locality throughout the Transdanubian Central Mountains range, where Bathonian ammonites have been recovered, while elsewhere this stage is already represented by radiolarites. On the other hand, as a result of faunal samplings carried out at several points within the Bakony, the Humphriesianum Zone can be uniformly elaborated. For this reason, the relevant fauna has been omitted from the present monograph.

The most complete stratigraphic sequence and the richest fauna have been yielded by Profile VI. The relevant major stratigraphic and faunistic results were presented in a preliminary report (Galácz 1970). The full faunal lists are given, zone by zone, in the Hungarian text. The information presented hereinafter being restricted to the essential stratigraphic data.

Upper Bajocian

Subfurcatum and Garantiana Zones

Beds 17 and 16 of the section can be assigned to the Subfurcatum and Garantiana Zones. The rich and diversified fauna has come almost entirely from Bed 16. Judging by the fauna, both the Subfurcatum and Garantiana Zones are represented in this heavily condensed layer not more than 30 cm thick. Unfortunately, the bed could not be further subdivided during samplings, so that the exact stratigraphic position of the individual species recovered could not be cleared. Of the faunal elements, *Caumontisphinctes polygyralis*, *Leptosphinctes (L.) davidsoni* and *L. (Cleistosphinctes) cleistus* indicate the middle, Polygyralis Subzone, while *Garantiana baculata* and *Spiroceras baculatum* refer to the upper, Baculata Subzone within the Subfurcatum Zone (cf. Pavia 1972, Parsons 1976). Bed 17, which has yielded much fewer evaluable ammonites, can be certainly assigned, again, to the middle subzone of the Subfurcatum Zone, as the *Stephanoceras* and *Teloceras* species characteristic of the lower Banksi Subzone are not represented.

In Bed 16, the characteristic elements of the Subfurcatum Zone are accompanied by *Hlawiceras*, some *Spiroceras* and *Bigotites* species, all representative of the Garantiana Zone. *Hlawiceras* refers to the middle, Trauthi Subzone, *Bigotites* to the upper, Tetragona Subzone (cf. Pavia 1972).

Parkinsoni Zone

Beds 15, 14 and 13 of Profile VI can be assigned to the uppermost zone of the Bajocian. The three subzones of the zone could not be exactly identified. The ammonite assemblage of Bed 15, especially the numerous *Vermisphinctes* species as well as the representatives of *Parkinsonia*, suggests the presence of the middle part of the Parkinsoni Zone. That the lower, Acris Subzone may also be included, in a condensed form though, is not unlikely, however.

Bed 14 has yielded a fauna poorer and less characteristic compared to that of the preceding one, standing closer rather to the top of the Parkinsoni Zone. *Phylloceras kunthi* and *Ptychophylloceras triplicatum* n. sp. forms more frequent in Bed 13, appear here.

Bed 13 appears to correspond to the Bomfordi Subzone, the frequency of the *Dimorphinites* species, first of all *D. dimorphus*, being conspicuous.

Lower Bathonian

Zigzag Zone

Unlike the Bajocian, the Bathonian beds of the profile have yielded a meagre ammonite fauna, poor in species. What is certain is that Beds 12 to 9 span the Lower Bathonian Zigzag Zone. *Procerites* and *Zigzagiceras* species, suggestive of the middle part of the Zigzag Zone have been recovered from Beds 11 and 10. For lack of diagnostic fossils of the Macrescens Subzone (Bathonian morphoceratids and parkinsoniids) the lower part of the zone cannot be identified, while the upper part is absent.

Middle Bathonian

Progracilis Zone

By virtue of the occurrence of the characteristic *Oxycerites* cf. *oxus* and *Suspensites suspensum* species, Bed 8 can be assigned to the Progracilis Zone.

Subcontractus Zone

Represented by the thickest sequence in Profile IV, the Subcontractus Zone comprises Beds 7 to 2. At its base (Beds 6—7) *Suspensites suspensum* and *Subgrossouvria uriniacensis* are characteristic, in the higher parts (Beds 5 to 2) *Rugiferites* and *Bullatimorphites* species and *Prohecticoceras o. ochraceum* are typical.

Morrisi Zone

The Morrisi Zone could not be identified, owing to the absence of zonal indices.

Upper Bathonian

Retrocostatum Zone

The topmost layer, Bed 1, of Profile VI, has yielded a representative fauna undoubtedly indicative of the basal part of the Retrocostatum Zone with characteristic *Procerites* and *Choffatia* species (="large perisphinctid fauna", see TORRENS 1967).

BIOSTRATIGRAPHIC CORRELATION

The six profiles explored in the vicinity of Gyenespuszta are readily correlable both faunistically and lithologically (Text-fig. 7). The Middle Jurassic sediments rest, in all sections, with a marked hiatus, on the rough surface of the Dachstein-type limestone. In Profiles II, V and VI, subsolution residues of an episodical Toarcian sedimentation can be found between the two formations. The deposition of the overlying radiolarites in the study area must have started in the higher part of the Upper Bathonian Retrocostatum Zone.

PALEONTOLOGY

GENERAL CHARACTERISTICS OF THE AMMONITE FAUNA

The fauna of the Middle Jurassic at Gyenespuszta corresponds to that of the red nodular limestones typical throughout the Tethys, so that it contains hardly any macrofossils other than ammonites. Just a few belemnite rostra, pseudoplanktonic *Inoceramus* and nautiloids have come to daylight. And the very subdued benthonic fauna is represented by one or two gastropods of *Pleurotomaria* type, a couple of brachiopods and irregular echinoids.

Profile VI was most suitable for a quantitative evaluation of the ammonite fauna, as here the fossils were sampled layer by layer and the sampled surfaces were precisely recorded. The surface area sampled in the upper part of the profile was 5 m^2, in the lower part — 2.8 m^2. The quantitative analytical results obtained for more than 4,000 ammonites were reported in an earlier paper (GALÁCZ 1970), so that only some essential data need to be presented here.

The quantitative predominance of phylloceratids and lytoceratids is a typical Tethyan feature (Text-fig. 8). Proceeding towards the overlying radiolarites, the fauna tends to get impoverished by and large; on the other hand, the ratio of the Ammonitina decreases, too. Similar tendency is manifested in other Bakony Mountains ammonite faunas as well (KONDA 1970, GÉCZY 1971).

The variation of the generic and specific diversity of the ammonite fauna has been evaluated (Text-fig. 9). According to the results obtained by FÜRSICH and SYKES (1977) for Oxfordian ammonites, the Tethyan ammonite faunas are characterized by a generic diversity higher than 10. In the Gyenespuszta fauna the value of the generic diversity is persistently above 10, and the specific diversity is also high. As shown by ARKELL (1951—59, p. 1), the Bathonian ammonite faunas are characterized by overall impoverishment. And, according to the Gyenespuszta results, this trend is manifested in the Tethyan faunas as well.

From the paleobiogeographic viewpoint, the Gyenespuszta ammonites show, all without any exception, Tethyan characters. As summarized by HALLAM (1975, p. 202), beside the representatives of phylloceratids and lytoceratids, the families or subfamilies Haploceratidae, Oppeliidae, Sphaeroceratidae, Clydoniceratidae, Tulitidae, Leptosphinctinae, Morphoceratidae and Zigzagiceratinae are characteristically confined to the Tethyan realm. In addition to these, the Dogger heteromorphs (DIETL 1973) and some stephanoceratids (*Cadomites, Polyplectites*, see THIERRY 1976) occur, for the most part, in the Tethys. The Parkinsoniidae and Pseudoperisphinctinae genera are similarly of Tethyan occurrence.

On the basis of the biogeographic distribution of the Late Jurassic ammonites it was CARIOU (1973) who defined, with higher precision, the boundary of the Boreal and Tethyan provinces and who delineated even subprovinces within them (see, in addition, FÜRSICH and SYKES 1977). The minor units appear to be recognizable already in the Bajocian and, particularly so, in the Bathonian. The Tethyan province in the strict sense is characterized by the predominance of phylloceratids and lytoceratids, whereas the sub-Mediterranean and sub-Boreal provinces in NW Europe are outlined by the presence of genera absent in Mediterranean regions. The Gyenespuszta fauna belongs to the Tethyan province in the strict sense, characterized by the abundance of phylloceratids and lytoceratids and by the absence of *Clydoniceras*, morphoceratids (except for *Dimorphinites*) and the scarcity of parkinsoniids—frequent in both the sub-Mediterranean and the sub-Boreal subprovinces.

The descriptive part of this monograph includes data concerning the distribution of the individual genera. Because of the lack of precision as to the separation of sub-Boreal and sub-Mediterranean regions in the Bajocian and the Bathonian, these have been referred to uniformly as NW European regions.

SEXUAL DIMORPHISM

During the elaboration of the bulky ammonite collection of Gyenespuszta the phenomena of sexual dimorphism have also been examined. In the 1960's this subject was dealt with by authors of several fundamental works (CALLOMON 1963, MAKOWSKI 1963, WESTERMANN 1964) and, subsequently, it was discussed in particular detail in scores of minor papers (see LEHMANN 1976, KENNEDY and COBBAN 1976).

Some doubts can be expressed, however, as regards the s e x u a l nature of dimorphism in ammonites.

1. No dimorphism could so far be identified among the phylloceratids and lytoceratids so abundant in the Tethys. The sporadical, single data available (e.g., most recently by JOLY 1976) are unconvincing and not generalizable.

2. The sexually dimorphic pairs established for representatives of Jurassic ammonites unite, in the majority of the cases, stratigraphically different genera.

Relying on the relevant literature, the author has compiled for the Bajocian and Bathonian ammonites, met with also at Gyenespuszta, a tabulation in which the genera showing some dimorphism have been recorded (Table 2). The essential differences in stratigraphic range between microconchs and macroconchs are conspicuous.

The unequal stratigraphic range of members of dimorphic pairs is explained by changes in facies (see e.g., LEHMANN 1976, p. 78). This has been the reason for the compilation of another variant of Table 2 (Table 3), in which the dimorphic matches from Profile VI at Gyenespuszta have been recorded. In spite of the uniformity of the lithology of the profile in question, the occurrence of members of dimorphic pairs, especially that of the microconchs, is quite occasional. Microconchs of Haploceratidae, Hecticoceratinae and Parkinsoniidae are totally absent, while microconchs of *Cadomites*, *Dimorphinites* and some perisphinctids are subordinately present.

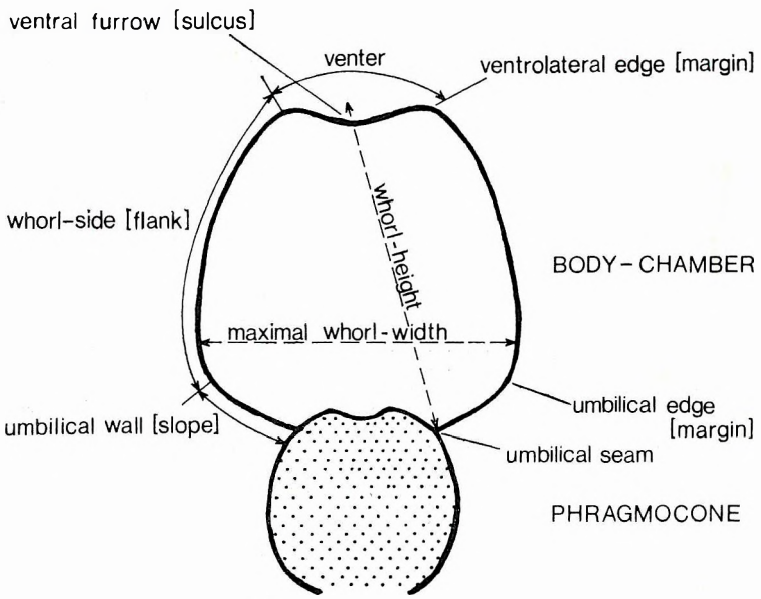
Given the above uncertainties, to speak of s e x u a l dimorphism in ammonites does not seem to be justified. Nevertheless, on account of the coincidence of early ontogenetic stages the dimorphism of some groups cannot be doubted. This has been the reason for adopting, in the systematic part, microconch-macroconch matches of subgeneric level, as was proposed by CALLOMON (1963). In the paleontological description of each (sub)genus, reference is made to the dimorphism of the forms being dealt with.

SYSTEMATIC DESCRIPTIONS

In the descriptions the use of morphologic terms follows the terminology of the Treatise (see ARKELL et al. 1957). The explanation of the most commonly used terms is shown in Text-fig. 10. The common abbreviations are as follows:

D = diameter,
H = whorl-height,
h = whorl-height in percentage of the diameter,
W = whorl-width (thickness),
w = whorl-width in percentage of the diameter,
U = umbilical width,
u = umbilical width in percentage of the diameter,
E = external lobe,
L = lateral lobe,
$L_{1,2}$ = first or second lateral lobe,
LS = lateral saddle,
ES = external saddle.

The dimensions are given following the usage of ARKELL (1951—59, pp. 23—25). The measurements refer to values in millimetres, in D—H, h—W, w—U, u order. Numbers in brackets indicate percentages of the diameter.



Text-fig. 10. Explanation of morphologic terms used in the descriptions

The whorl-section figures of the ammonites were drawn from photographs of sectioned specimens. The dotted parts indicate phragmocones, the white parts body-chambers, respectively. Suture-line figures were drawn by means of projector microscope. Horizontal lines in the whorl-section and suture-line figures represent 10 millimetres, except where otherwise indicated. Before photographing, the specimens were whitened by ammonium-chloride.

The whole material is deposited in the paleontological collections of the Hungarian Geological Institute, Budapest. The numbers correspond to the inventory numbers of this collection. The types described in the text are separately reposited in this collection.

Ordo **AMMONOIDEA** ZITTEL, 1884
Subordo **PHYLLOCERATINA** ARKELL, 1950
Superfamilia **Phylloceratac eae** ZITTEL, 1884
Familia **Phylloceratidae** ZITTEL, 1884

Genus PHYLLOCERAS SUESS, 1865

Genotype: *Am. heterophyllus* SOWERBY (1821, p. 119, pl. 266, fig. 1).

General remarks: BESNOSSOW (1957, p. 166) introduced the genus *Pseudophylloceras* for some species of *Phylloceras*, judging principally by features of the embryonal and inner whorls, and the presence of ribs on the outer whorls. However, these differences seem to be insufficient for the establishment of a new genus, the less so for that of a new subfamily (Pseudophylloceratinae BESNOSSOW 1967).

Distribution: The representatives of the genus *Phylloceras* and its subgenera occur from the Lower Jurassic Sinemurian to the Upper Cretaceous Maastrichtian. It is a characteristic Tethyan genus, with several species appearing also at NW European localities.

Dimorphism: Dimorphic phenomena within the s.s. *Phylloceras* group have not been recorded so far.

Phylloceras trifoliatum NEUMAYR, 1871

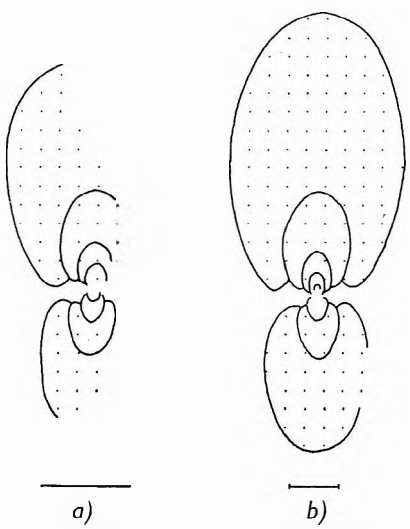
Pl. I, figs. 1—3, Text-figs. 11—12

1871. *Phylloceras trifoliatum* nov. sp. — NEUMAYR, p. 309, pl. XII, figs. 2—3.
1912. *Phylloceras trifoliatum* NEUMAYR var. — ROMAN—GENNEVAUX, p. 65, pl. I, fig. 1. text-fig. 7.
?1913. *Phylloceras trifoliatum* NEUMAYR — ROMAN, p. 47, pl. I, fig. 16.
1920. *Phylloceras* aff. *kudernatschi* HAUER — SPATH, p. 312, pl. V, figs. 1. a-c.
1920. *Phylloceras* cf. *Kunthi* NEUMAYR — SPATH, p. 312, pl. V, figs. 3. a-c.
non 1923. *Phylloceras trifoliatum* NEUMAYR — SIEMIRADZKI, p. 25, pl. VI, fig. 12.
1964a. *Phylloceras trifoliatum* NEUMAYR — STURANI, p. 9, pl. I, figs. 3. a-b, text-fig. 1.
1966. *Phylloceras (Phylloceras)* cf. *trifoliatum* NEUMAYR, 1871 — BREMER, p. 165, pl. 18, figs. 3. a-b.
1970. *Phylloceras trifoliatum* NEUM. — GALÁCZ, p. 123.
1975. *Phylloceras* cf. *P. trifoliatum* NEUMAYR — WESTERMANN, p. 37, pl. 1, figs. 1—4.

Material: 41 relatively well-preserved and 120 fragmentary specimens.

Dimensions:	D	H (h)	W (w)	U (u)
J9247:	102;	65.5 (64);	37 (36);	2 (1.9)
J9246:	101;	64 (63);	45 (44);	?2.5 (?2.5)
	88;	53.5 (60);	36 (41);	1.5 (1.7)
J9252:	65.5;	40.5 (62);	23 (35);	1 (1.5)
	24;	14 (58);	10 (41);	0 (0)

Description: Medium-sized internal moulds, some specimens with test remains. Umbilicus narrow, almost occluded on the inner whorls. Whorl-section (Text-fig. 11) elliptical, with an oblique umbilical slope, evenly convex whorl-sides and a highly-arched venter. The maximal thickness lies somewhat below the medium height of the flanks. The test is smooth with only weak, fine growthlines. The internal mould is completely smooth. The specimens are generally septate up to about 100 mm diameter, specimens with entire body-chamber and preserved adult peristome are unknown in the material.

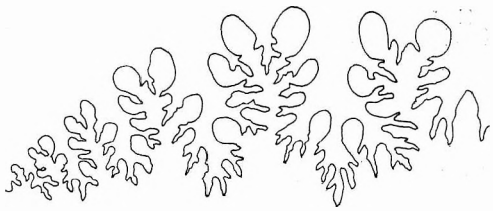


Text-fig. 11. Whorl-sections of *Phylloceras trifoliatum* (a: J9250, b: J9251), both from Profile VI/Bed 16, Subfurcatum and Garantiana Z.

The suture-lines (Text-fig. 12) are distinct. Characteristic is the relatively deep external lobe with a short ventral saddle, and the triphyllid endings of the first, second and, occasionally, the third lateral saddles.

Remarks: NEUMAYR (1871, p. 309) presented with his original description only the suture-line figure of the type specimen from the Toarcian-Aalenian to basal Bajocian of Cap San Vigilio. Presumably this is why this species is so rarely mentioned in the literature. On the basis of the previously figured specimens and the rich Gyenespuszta material, *P. trifoliatum* can be easily distinguished from other Middle Jurassic *Phylloceras* species. Its diagnostic features are the smooth test and internal mould, the highly-oval whorl-section with a highly-arched venter and a triphyllid second (and third) lateral saddle. On the basis of this latter feature, its internal mould differs from the otherwise similar *P. kudernatschi*, which has a diphyllid second lateral saddle.

Conspecific forms have been figured by SPATH (1920) under the names *P.* aff. *kudernatschi* and *P.* cf. *kunthi*. The specimens were refigured by WESTERMANN (1975, pl. 1, figs. 2, 3), and his figures clearly show the presence of this species.



Text-fig. 12. Suture-line of *Phylloceras trifoliatum* (J9249), VI/17, Subfurcatum Z.

D i s t r i b u t i o n : NEUMAYR based this species on specimens from the Murchisonae Zone of northern Italy and the Carpathians. Subsequent records came from several localities of the Mediterranean region, from stratigraphically higher horizons too. At Gyenespuszta this is one of the most common forms, occurring from the Subfurcatum up to the Parkinsoni Zones (Beds 17 to 13). During the preliminary phase of this work several internal moulds from the Bathonian had been identified as *P.* cf. *trifoliatum* (GALÁCZ 1970, p. 123). Careful studies have shown that these Bathonian forms can be assigned the species *P. kudernatschi*, consequently *P. trifoliatum* is confined at Gyenespuszta also to the Bajocian.

Phylloceras isomorphum GEMMELLARO, 1872

Pl. I, fig. 4, Pl. II, figs. 1–2, Text-figs. 13–16

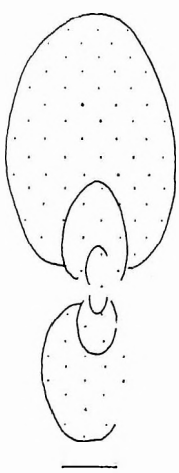
1872. *Phylloceras isomorphum* GEMM. — GEMMELLARO, p. 167, pl. 1, figs. 1. a-b.
non 1877. *Phylloceras isomorphum* GEMM. — GEMMELLARO, p. 56, pl. IV, fig. 16.
1905. *Phylloceras isomorphum* GEMM. — DEL CAMPANA, p. 26, pl. I, figs. 6–7, text-fig. 1.
1935. *Phylloceras Kudernatschi* HAU. — PASSENDORFER, p. 6. pl. II, fig. 2.
1957. *Phylloceras plicatum* NEUM. — HIMSHIASHVILI, p. 18, pl. III, figs. 1–2.
1964b. *Phylloceras kudernatschi* (HAUER) *isomorphum* G. GEMMELLARO — STURANI, p. 9, pl. I, fig. 1, Text-fig. 3.
1970. *Phylloceras isomorphum* GEMM. — GALÁCZ, p. 123.
1976. *Phylloceras kudernatschi* (VON HAUER) f. *isomorphum* GEMMELLARO — JOLY, p. 158, with figures.

M a t e r i a l : 22 well-preserved and 72 fragmentary specimens.

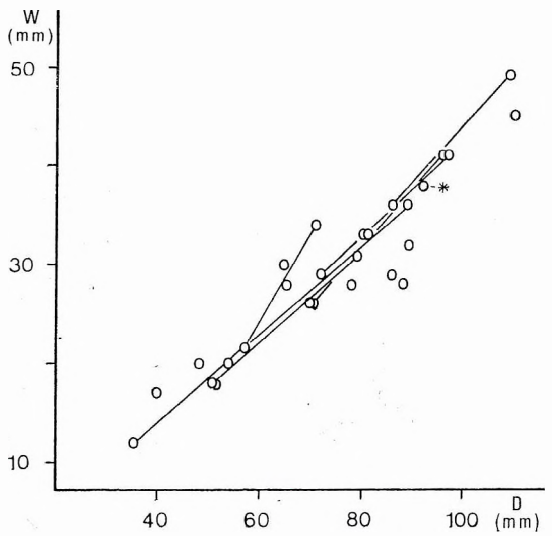
D i m e n s i o n s :

J9205:	109;	70 (64);	49 (45);	?9	(?8)
J9207:	97;	56.5 (58);	41 (42);	7	(7)
J9201:	86;	49 (57);	25 (29);	7	(8)
J9203:	78;	45.5 (58);	28 (35);	6	(7)
J9202:	51;	30.5 (59);	18 (35);	?4.5	(?8)

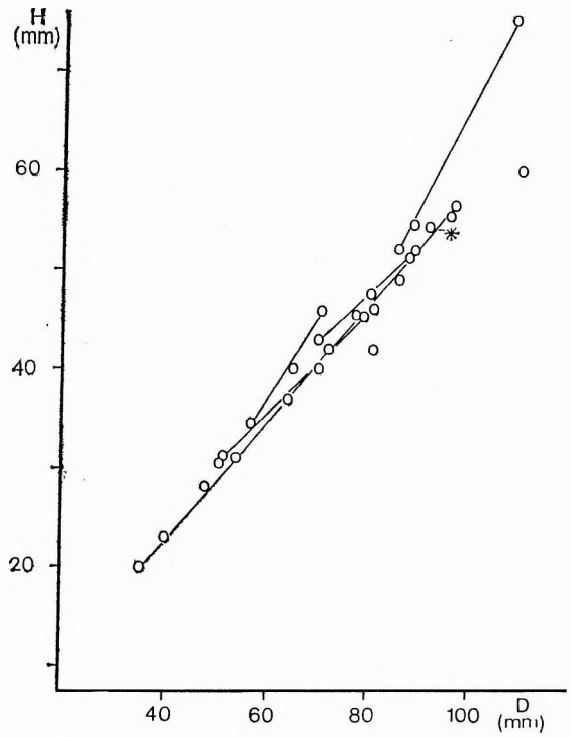
D e s c r i p t i o n : A robust form represented by medium-sized to large specimens with relatively wide umbilicus and funnel-shaped umbilical area. The whorl-sides are rather convex, the venter is widely-arched. The whorl-section (Text-fig. 13) is ovally-shaped, with somewhat variable whorl-width, i.e. it is somewhat wider on the body-chamber than on the septate whorls. Both the test and the internal mould are ornamented. The shell is covered by fine, slightly curved riblets on the outer



Text-fig. 13. Whorl-section of *Phylloceras isomorphum* (J9206), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 14. Whorl-width plotted against diameter for specimens of *Phylloceras isomorphum* from Gyenespuszta.
* = lectotype



Text-fig. 15. Whorl-height plotted against diameter for specimens of *Phylloceras isomorphum* from Gyenespuszta. * = lectotype

third of the flanks and on the venter, and there are stronger, blunt, slightly sigmoid folds starting from the umbilical slope. The strength and density of these latter are somewhat irregular. The number of the shorter riblets between the folds is 3 to 4. On the internal mould the ornamental elements are shorter and confine rather to the outer whorls.

Despite the rich material the entire suture-line cannot be seen. On the basis of the observed portions (Text-fig. 16) the external lobe is relatively short, other lobes are deeper and narrow. The first lateral saddle is diphyllic, like the somewhat longer second lateral one. The auxiliaries number 4 to 5.

R e m a r k s : In the literature the specific and even the generic state of this form is rather controversial. On the basis of the strong ornamentation, it has been assigned to the genus *Partschiceras* auct. (Besnossow 1958a, p. 39). However, the shape of the whorl-section and the pattern of the suture-line undoubtedly show a typical *Phylloceras* s.s. On the other hand, some authors (e.g. Sturani 1964b, p. 9) assigned this form as a subspecies to the species *P. kudernatschi* (Hauer). These two closely allied forms unquestionably show some resemblance, especially in the shape of the whorl-section (see Text-figs. 14—15) and in the characters of the suture-line. However, a significant difference is that the internal mould of *P. isomorphum* is ornamented, while that of *P. kudernatschi* is smooth. The dimensions are nearly equal, but *P. kudernatschi* bears a narrower umbilicus and shows a comparatively greater whorl-height ratio.

On the basis of its ornamented internal mould, *P. isomorphum* is an easily distinguishable form. A similar form is *P. kunthi* Neumayr, but it differs in having characteristically flattened whorl-sides.

D i s t r i b u t i o n : The type came from condensed Upper Bathonian to Middle Callovian beds of Sicily (see Wendt 1964, p. 72). Subsequent records suggest a mainly Bathonian stratigraphic range, but Sturani (loc. cit.) described it from the Upper Bajocian too. This typically Mediterranean species is a common element of the Gyenespuszta fauna. It is confined to the Upper Bajocian and Lower Bathonian, i.e. to Beds 17 to 11. It occurs in greatest number of specimens in Bed 16 (Subfurcatum-Garatiana Zones).

Text-fig. 16. Suture-line of *Phylloceras isomorphum* (J9204), VI/15, Parkinsoni Z.

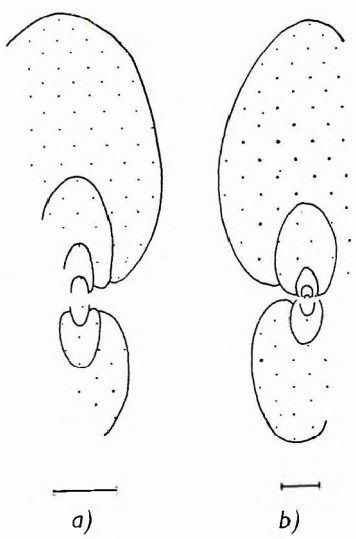
Phylloceras kudernatschi (Hauer, 1854)

Pl. III, figs. 1—2, Text-figs. 17—20

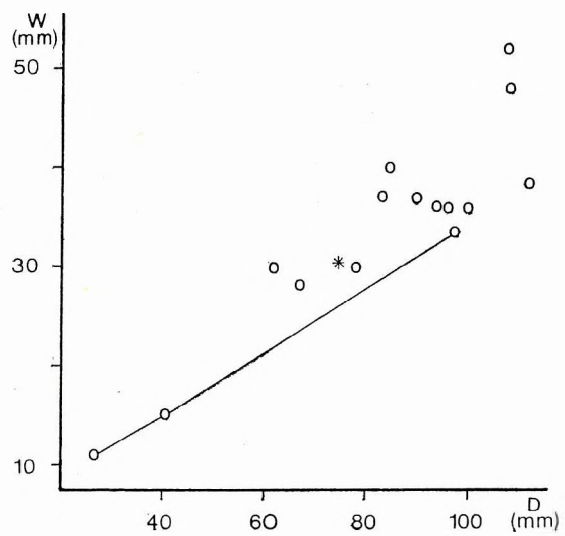
1852. *Ammonites heterophyllus* Sow. var. — Kudernatsch, p. 6, pl. 1, figs. 5—9.
1854. *Ammonites Kudernatschi* v. Hauer — Hauer, p. 902.
non 1869. *Phylloceras Kudernatschi* Hauer sp. — Zittel, p. 67, pl. I, fig. 13.
1871. *Phylloceras Kudernatschi* Hauer — Neumayr, p. 310, pl. XII, figs. 4—5.
non 1877. *Phylloceras Kudernatschi* v. Hauer sp. — Gemmellaro, p. 54, pl. III, figs. 3—4.
1890. *Phylloceras Kudernatschi* Hauer — Jüssen, p. 387, pl. II, fig. 1.
non 1905. *Phylloceras Kudernatschi* Hauer — Simionescu, p. 8, pl. I, figs. 5—7.
1905. *Phylloceras Kudernatschi* Hauer — Popovici-Hatzeg, p. 10, pl. I, figs. 1—9.
1912. *Phylloceras* ex aff. *Kudernatschi* Hauer — Tsytovitch, p. 195, pl. II, fig. 2.
1915. *Phylloceras Kudernatschi* Hauer — Lóczy, p. 27, pl. I, fig. 1, text-figs. 4—5.
non 1920. *Phylloceras* aff. *Kudernatschi* Hauer — Spath, p. 312, pl. V, figs. 1. a-c.
1924. *Phylloceras Kudernatschi* Hauer — Roman, p. 87, pl. VII, fig. 2.
non 1927. *Phylloceras* cf. *Kudernatschi* von Hauer sp. — Burckhardt, p. 9, pl. I, figs. 1—3.
1928. *Phylloceras Kudernatschi* Hauer — Sayn—Roman, p. 53, pl. V. fig. 1.
1931. *Phylloceras Kudernatschi* v. Hauer — Floridia, p. 98, pl. III, fig. 5.
?1935. *Phylloceras Kudernatschi* v. Hauer — Bircher, p. 132, text-fig. 13.
non 1935. *Phylloceras Kudernatschi* Hau. — Passendorfer, p. 6, pl. II, fig. 2.
?1956. *Phylloceras kudernatschi* Hauer — Ksiazkiewicz, p. 182, pl. XX, fig. 13, text-fig. 7.
1958a. *Pseudophylloceras kudernatschi* (Hauer) — Besnossow, p. 62, pl. XII, figs. 1—3, text-figs. 27, 28.
?1958a. *Pseudophylloceras* sp. n. ex gr. *kudernatschi* (Hauer) — Besnossow, p. 64, pl. XII, fig. 5., text-fig. 29.
non 1958. *Phylloceras Kudernatschi* v. Hauer — Collignon, pl. VIII, fig. 41.
1959. *Phylloceras kudernatschi* Hauer — Kaszap, p. 264, pl. IX, fig. 1.
1960. *Phylloceras kudernatschi* Hauer — Raileanu—Pelin, p. 41, pl. I, fig. 4.
1963. *Pseudophylloceras kudernatschi* (Hauer) — Azarian, p. 180, pl. VI, figs. 5—6, text-fig. 45.
?1963. *Phylloceras kudernatschi* (Hauer) — Preda, p. 77, pl. VI, fig. 3.
1964b. *Phylloceras kudernatschi* (Hauer) — Sturani, p. 9, text-fig. 2.
1969. *Pseudophylloceras kudernatschi* (Hauer) — Romanov, p. 82, pl. I, figs. 11—12.
1970. *Phylloceras kudernatschi* Hauer — Galácz, p. 123.
1971. *Pseudophylloceras kudernatschi* (Hauer) — Sturani, p. 83, pl. 2, fig. 1.
1971. *Phylloceras kudernatschi* (Hauer) — Maxim et al., p. 406, pl. I, figs. 3—7.
1972. *Phylloceras kudernatschi* (Hauer) — Krystyn, p. 211, pl. 1, fig. 2.
1976. *Phylloceras kudernatschi* (von Hauer) — Joly, p. 151, and figures.
non 1976. *Phylloceras* cf. *kudernatschi* (von Hauer) — Joly, p. 161, and figures.

Material: 68 more or less well-preserved and several fragmentary specimens.
Dimensions: J9209: 96; 56 (58); 36 (37); ?5 (?5)
J9207: 83; 53 (64); 35 (42); ?3.5 (?4.2)
J9210: 62; 37 (59); 30 (48); 4.5 (7)

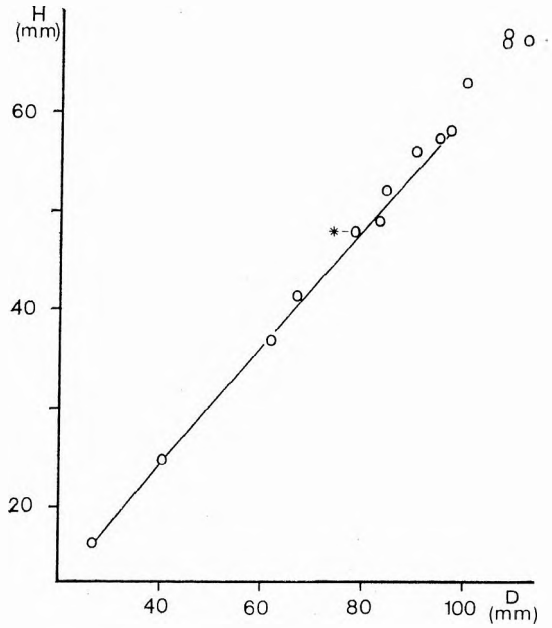
Description: Medium-sized form, the largest specimen shows a measurable maximum of 110 mm in diameter. The umbilicus is narrow and deep, the umbilical slope is steep, the umbilical margin is rounded. The whorl-section (Text-fig. 17) is ovally-shaped, with convex whorl-sides and



Text-fig. 17. Whorl-sections of *Phylloceras kudernatschi* (a: J9208, VI/5, b: J9441), VI/3, Subcontractus Z.



Text-fig. 18. Whorl-width plotted against diameter for specimens of *Phylloceras kudernatschi* from Gyenespuszta.
* = holotype



Text-fig. 19. Whorl-height plotted against diameter for specimens of *Phylloceras kudernatschi* from Gyenespuszta. * = holotype

a highly arched venter. The maximal whorl-width lies near the middle of the whorl-height. The internal mould is smooth, only the test being ornamented. The ornamentation consists of fine riblets initially radial, then curved forwards, arising from the umbilical margin. Some riblets irregularly form stronger radial folds in the outer part of the flanks. The specimens, as a rule are wholly septate, the body-chamber is visible only fragmentarily on some specimens. No aperture is preserved.

The suture-line (Text-fig. 20) is complex. The high saddles, wide lobes and the relatively few auxiliaries are characteristic. The second lateral saddle is diphyllic.

Remarks: The closest relative of *P. kudernatschi* is the morphologically similar *P. isomorphum* (distinction see above). The internal moulds of *P. kudernatschi* resemble those of *P. trifoliatum*, but the latter species has a narrower umbilicus, more convex whorl-sides and a triphyllic second lateral saddle. *P. kunthi* is distinguished by its ornamented internal mould.

P. kudernatschi is a form frequently cited in the literature, but a part of the citations are based on misidentifications. The original of the figure of ZITTEL (1869, pl. I, fig. 13) was assigned to *P. kunthi* by NEUMAYR (1871, p. 312). The specimen figured by GEMMELLARO (1877, pl. III, figs. 3—4) is similarly a *P. kunthi* (see STURANI 1964b, p. 10). The figures of SIMIONESCU (1905, pl. I. figs. 5—7) cannot be identified with the species. The specimen from Mexico (BURCKHARDT 1927, pl. I, figs. 1—3) with a tabulate venter and flattened whorl-sides is certainly not conspecific. The widely umbilicate, ornamented internal mould figured by PASSENDORFER (1935, pl. II, fig. 2) is a good *P. isomorphum* specimen.

Text-fig. 20. Suture-line of *Phylloceras kudernatschi* (J9211), VI/8, Progracilis Z.

Distribution: The type of this typically Mediterranean form came from the condensed Bathonian bed of Swinitza (HAUER 1854). On the basis of subsequent records, the species ranges from the Upper Bajocian up to the Lower Oxfordian. At Gyenespuszta this relatively common species is confined to the Bathonian, i.e. to Beds 11 to 1.

Phylloceras kunthi NEUMAYR, 1871

Pl. III, figs. 3—4

1869. *Phylloceras Kudernatschi* HAUER sp. — ZITTEL, p. 67, pl. I, fig. 13.
1871. *Phylloceras Kunthi* nov. sp. — NEUMAYR, p. 312, pl. XII, fig. 6, pl. XIII, figs. 1. a-b.
1872. *Phylloceras Kunthi* NEUM. — GEMMELLARO, p. 8, pl. II, figs. 3—4.
?1875. *Phylloceras* cf. *Kunthi* NEUM. — WAAGEN (1873—75), p. 25, pl. V, figs. 2. a-c.
1877. *Phylloceras Kudernatschi* v. HAUER sp. — GEMMELLARO, p. 54, pl. III, figs. 3—4.
1877. *Phylloceras isomorphum* GEMM. — GEMMELLARO, p. 56, pl. IV, fig. 16.
non 1920. *Phylloceras* cf. *Kunthi* v. HAUER sp. — SPATH, p. 312, pl. V, figs. 3. a-c.
non 1931. *Phylloceras Kunthi* NEUMAYR — FLORIDIA, p. 97, pl. III, fig. 2.
?1935. *Phylloceras* sp. aff. *Kunthi* NEUM. — PASSENDORFER, p. 8, pl. II, figs. 3. a-b.
?1951. *Phylloceras* cf. *Kunthi* NEUMAYR — JEANNET, p. 26. pl. 5, fig. 2, text-fig. 51.
1958. *Phylloceras Kudernatschi* v. HAUER — COLLIGNON, pl. VIII, fig. 41.
1958a. *Pseudophylloceras* cf. *kunthi* (NEUMAYR) — BESNOSSOW, p. 65, pl. XII, figs. 4. a-b, text-fig. 30.
1964a. *Phylloceras kunthi* (NEUMAYR) — STURANI, p. 38, pl. VI, fig. 5.
1964b. *Phylloceras kunthi* NEUMAYR — STURANI, p. 10, text-fig. 4.
?1964. *Phylloceras* cf. *P. kunthi* NEUMAYR — IMLAY, p. B31, pl. 2, figs. 3—4.
1970. *Phylloceras isomorphum* GEMM. — GALÁCZ, p. 123, (pars).
non 1973. *Pseudophylloceras* cf. *kunthi* (NEUMAYR) — PAITSCHADZE, pl. III, figs. 4. a-b, pl. XXXIII, fig. 10.
1976. *Phylloceras kunthi* NEUMAYR — JOLY, p. 162, pl. 3, fig. 2, pl. 39, fig. 9.

Material: Two, relatively well-preserved, though fragmentary, specimens.
Dimensions: J9213: 98; 57 (58); 30 (30.6); ?3.5 (?3.5)
J9214: 92; 52 (56); 30 (32); — (—)

Description: Medium-sized, compressed forms. The umbilicus is narrow and shalow, the umbilical slope gradually arches into the whorl-side. The whorl-section is compressed-oval in shape, with slightly convex flanks, the maximal thickness lies at the lower third of the whorl-sides. The flanks meet the slightly depressed, narrow venter in a rounded ventrolateral shoulder. Both the shell and the internal mould are ornamented. There are longer, blunt, slightly curved folds starting from the lower third of the flanks. Near the upper third of the flanks fine, dense, almost radial riblets arise which are slightly projected on the venter. Over the last half of the specimen figured on Pl. III, fig. 4 the number of the longer folds is 19. Between these folds appear 8 to 9 riblets. The ribs are somewhat stronger and longer on the shell. At 90 mm diameter one of the two specimens is septate, the other shows a half whorl body-chamber.

The suture-line can be studied in some exposed portions. The ventral lobe is short with divergent branches, the first lateral is deeper and wide. The second lateral and the auxiliaries are hardly visible, but the latter are relatively numerous.

Remarks: The species *Phylloceras kunthi* belongs to the Middle Jurassic *Phylloceras* with ornamented internal mould. A closely related form is *P. plicatum* NEUMAYR, but it differs in having more stouter whorls. Another similar species is *P. isomorphum* GEMMELLARO, but it has a deeper, funnel-shaped umbilicus, convex whorl-sides and a deep ventral lobe in the sutures. This species was figured by GEMMELLARO (1877, pl. III, figs. 3—4, pl. IV, fig. 16) under the names *P. kudernatschi* and *P. isomorphum* (see WENDT 1964, p. 112). On the other hand, the East African specimen of SPATH (1920, pl. V, fig. 3) shows a smooth internal mould and can be assigned rather to the species *P. trifoliatum* NEUMAYR (see WESTERMANN 1975, p. 37, pl. 1, fig. 2). FLORIDIA (1931, pl. III, fig. 2) figured his Sicilian Middle Jurassic specimen only in lateral view, but the ribbing shows less blunt folds, therefore it cannot be conspecific. According to the figures, the specimen of PASSENDORFER (1935, pl. II, figs. 3. a-b) is indeterminable. On the basis on JOLY's refiguration (1976) the specimen figured firstly by COLLIGNON (1958, pl. VIII, fig. 41) certainly belongs to *P. kunthi*. The Callovian form figured by PAITSCHADZE (1973, pl. III, figs. 4. a-b, pl. XXXIII, fig. 10) from the Caucasus belongs certainly to genus other than this, showing constrictions and different whorl-section.

Distribution: The type was described by NEUMAYR (1871, p. 312) from the Lower Callovian of Austria. The subsequent records refer to Bajocian, Bathonian and Callovian occurrences from Tethyan localities. It is a rare element in the Gyenespuszta fauna; the specimens have come from Bed 14 and 13, i.e. from the Parkinsoni Zone.

Genus ADABOFOLOCERAS JOLY, 1976

Type species by original designation (JOLY 1976, p. 118) is "*Partschiceras*" *adabofolense* COLLIGNON (1958, pl. 12, fig. 63).

General remarks: The former, questionable practice which assigned some Middle and Upper Jurassic phylloceratids to the genus *Partschiceras* has recently been settled taxonomically by the justifiable procedure of JOLY. On the basis of his revision, the new name for the "*Phylloceras*"

subobtusum group is *Adabofoloceras*. In his diagnosis of this new genus, he has included characters (e.g. strong, somewhat irregular ribbing in the outer half of the flanks and on the venter, pronounced longitudinal ridges on the whorl-sides) distinguishing this group from the Lower Jurassic *Partschiceras* s.s.

Distribution: The designation of *Adabofoloceras* solves the problem caused so far by the hiatuses in the "*Partschiceras*" lineage in the Lower Bajocian and Oxfordian-Kimmeridgian (see WIEDMANN 1963, p. 233). According to the interpretation, the earliest *Adabofoloceras* species (*A. abichi*, *A. haloricum* etc.) appear in the Middle and Upper Bajocian, and the genus endures, with moderate diversity, up to the Callovian. According to some recent records (see FREBOLD and TIPPER 1975, p. 115, pl. 2, figs. 1—2), the youngest representatives of the genus seem to have come from the Oxfordian. It remains for further studies to decide whether the uppermost Jurassic and Lower Cretaceous "*Partschiceras*" species need introduction of a new generic name, or can be assigned to existing genera.

Dimorphism: No attempt at distinguishing dimorphism within this ammonite group has been made.

Adabofoloceras hajagense n. sp.

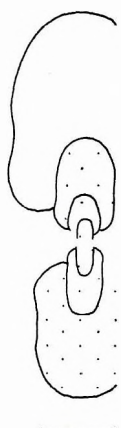
Pl. IV, figs. 1—3, Text-figs. 21—22

1970. *Partschiceras* n. sp. — GALÁCZ, p. 123.

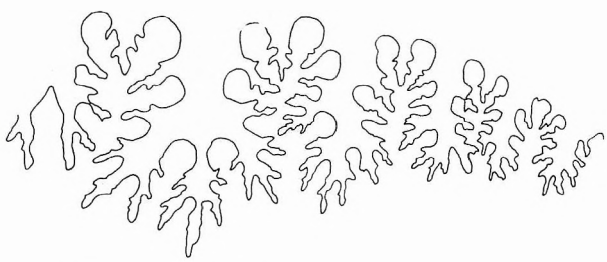
Holotype: Pl. IV, fig. 1; J9218.
Locus typicus: Gyenespuszta, Northern Bakony, Transdanubian Central Mountains; Profile VI.
Stratum typicum: Bed 16; Upper Bajocian, Strenoceras subfurcatum and Garantiana garantiana Zones; ammonitico rosso limestone.
Derivatio nominis: After Hajag, the name of the group of hills, to which the Gyenespuszta locality belongs.
Diagnosis: A relatively large *Adabofoloceras* with a longitudinal furrow on the lower third of the whorl-sides and an outer ribbing curved forwards, strong and crinkle-like, on the outer whorls.
Material: Beside the holotype, there are 14 well-preserved and 16 fragmentary specimens.

Dimensions:					
Holotype,	J9217: 74;	39 (53);	37 (50);	7	(9.5)
	J9218: 63;	32 (51);	28 (44.5);	9	(14)
	J9215: 62;	33 (53);	29 (47);	9	(14.5)
	J9219: 62;	32 (52);	?25 (?40);	6.5	(10.5)

Description: The holotype is a medium-sized, relatively well-preserved internal mould, with some remnants of the test. The umbilicus is relatively wide, deep, funnel-shaped. The umbilical wall is high and oblique, the umbilical margin is rounded. The whorl-section is compressed-oval in shape, with flattened whorl-sides, rounded ventrolateral edge and wide, convex venter (Text-fig. 21). The maximal thickness lies at the inner fourth of the flanks. At the inner third of the whorl-sides runs a wide, well-distinguished longitudinal furrow, which is especially pronounced on the body-chamber. The whorls are comparatively smooth up to about 35 mm, then outer ribs appear. These crinkle-like ribs arise at the outer third of the flanks, they are prorsiradiate then arched backward,



Text-fig. 21. Whorl-section of *Adabofoloceras hajagense* n. sp. (J9215), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 22. Suture-line of *Adabofoloceras hajagense* n. sp. Holotype (J9218), VI/16, Subfurcatum and Garantiana Z.

and strongly convex forward on the venter. The density, length and strength of the ribs are somewhat irregular. On the body-chamber the ribbing becomes extremely coarse (see Pl. IV, fig. 3). On the specimens the septation ceases generally at 40 mm diameter, but the length of the body-chamber cannot be recognized because there is no entire specimen in the studied material.

The suture-line (Text-fig. 22) is complex. E is short and narrow, L is wider and symmetrically trifid, the other lobes are asymmetrical. The high and slender saddles are diphyllic.

Remarks: This new species differs from the other known *Adabofoloceras* species in having the lateral longitudinal furrow and the characteristic outer ribbing. Other distinguishing features are the relatively wide umbilicus and the diphyllic saddles in the suture-line. The other Middle Jurassic *Adabofoloceras* species generally show tetraphyllic ES and LS. The material mainly consists of internal moulds, but the preserved remains of the test suggest that those specimens with shell have a coarser ribbing and the ribs form sharp ridges on the venter of the body-chamber.

Distribution: The specimens assigned to this new species have come from Beds 17 and 16 of Profile VI, i.e. from the Subfurcatum and Garantiana Zones of the Upper Bajocian.

Adabofoloceras subobtusum (KUDERNATSCH, 1852)

Pl. IV, figs. 4—5, Text-figs. 23—24

1852. *Ammonites subobtusus* KD. — KUDERNATSCH, p. 7, pl. II, figs. 1—3.
1877. *Phylloceras subobtusum* KUD. sp. — GEMMELLARO, p. 53, pl. III, fig. 2.
non 1894. *Phylloceras subobtusum* KUD. sp. — PARONA, p. 371, pl. I, fig. 1.
non 1898. *Phylloceras subobtusum* KUDERN. — STRÉMOOUKHOFF, p. 395, pl. II, fig. 5.
1905. *Phylloceras subobtusum* KUD. — SIMIONESCU, p. 12. pl. I, figs. 11—12, text-fig. 8.
1905. *Phylloceras subobtusum* KUD. — POPOVICI-HATZEG, p. 11, pl. I, figs. 8—9.
non 1914. *Phylloceras* aff. *subobtusum* KUD. — ZATWORNITZKY, p. 542, pl. XVI, fig. 1.
non 1935. *Phylloceras subobtusum* KUDERNATSCH — ROMAN, p. 29, pl. IV, fig. 7.
1956. *Partschiceras subobtusum* KUDERN. — KAKHADZE—ZESASHVILI, p. 21, pl. I, fig. 7.
1957. *Partschiceras subobtusum* KUD. — HIMSHIASHVILI, p. 24, pl. III, figs. 7—8.
1958. *Partschiceras subobtusum* KUDERNATSCH — BESNOSSOW, p. 43, pl. VI, figs. 4. a-b, text-fig. 17.
non 1958. *Partschiceras subobtusum* KUD. — COLLIGNON, pl. XII, fig. 62.
non 1961. *Partschiceras subobtusum* KUDERNATSCH — KRYMHOLZ, p. 30, pl. I, fig. 4.
1963. *Partschiceras abichi* (UHLIG) — AZARIAN, p. 185, pl. VII, fig. 4. (only).
1966. *Phylloceras (Partschiceras) subobtusum* (KUDERNATSCH) — STURANI, p. 20, pl. 5, fig. 3.
1970. *Partschiceras viator* (D'ORB.) — GALÁCZ, p. 123. (pars).
?1971. *Phylloceras subobtusum* KUD. — MAXIM et al., p. 407, pl. II, figs. 1—4.
1972. *Partschiceras subobtusum* (KUDERNATSCH) — KRYSTYN, p. 214, text-fig. 6.
1976. *Adabofoloceras subobtusum* (KUDERNATSCH) — JOLY, p. 138, with figures.

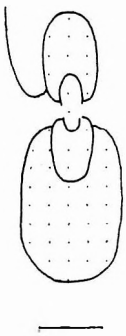
Material: 6 fragmentary specimens.
Dimensions: J9221: 71; 39 (55); 21 (30); 5 (7)

Description: Medium-sized, narrowly-umbilicated form. The periumbilical depression is bordered by a rounded, lateral margin. The whorl-sides are flattened, with a blunt longitudinal edge on the outer third of the flank. The ventrolateral margin is strongly rounded, but distinguishable; the venter is broadly arched. The whorl-section is compressed-oval in shape (Text-fig. 23), with maximal thickness at the outer third of the flanks. The radial ribs, which are slightly irregular in density and strength, arise at the outer spiral edge of the flanks and tend to become stronger towards the venter. The Gyenespuszta material consists exclusively of fragmentary specimens, thus the features of the body-chamber cannot be studied.

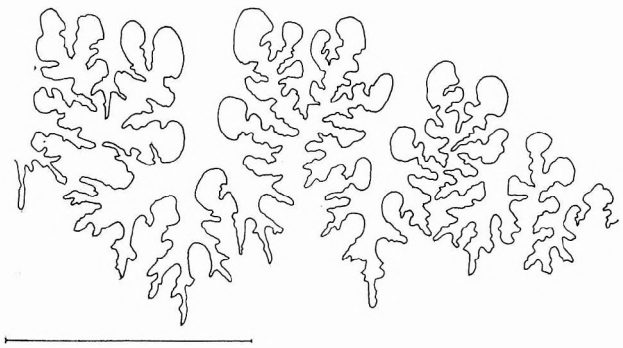
The suture-line (Text-fig. 24) is elaborate. The high ES and LS are tetraphyllic, the other, gradually shortening saddles are diphyllic.

Remarks: In spite of their fragmentary state, the Gyenespuszta specimens of this characteristic species can be well compared to the type figured by KUDERNATSCH (1852, pl. II, figs. 1—3). The distinctive features are the blunt edge on the outer third of the flanks and on the ventrolateral margin, the smooth inner whorls and the fine outer ribs appearing later. On the basis of these features, the specimens figured by PARONA (1894, pl. I, fig. 1), STRÉMOOUKHOFF (1898, pl. II, fig. 5) and ZATWORNITZKY (1914, pl. XVI, fig. 1) cannot be assigned to this species [with the style of ribbing and smooth venter, all are *A. abichi* (UHLIG)]. The specimen figured by ROMAN (1935, pl. IV, fig. 7) from Privas could rather be an *A. viator* (D'ORBIGNY). The specimen of COLLIGNON (1958, pl. XII, figs. 62, 62. a-b) and presumably several "*Partschiceras subobtusum*" recorded from the Upper Bathonian are most likely specimens of *Adabofoloceras villanyensis* (TRAUTH 1923, p. 224; synonym: *Partschiceras pseudoviator* DJANÉLIDZE 1933, p. 58, pl. VIII, figs. 2—4, pl. X, fig. 2). That form figured by KRYMHOLZ (1961, pl. I, fig. 4) from the Bathonian of Daghestan seems to be a specimen of *A. bjelinskiji* BESNOSSOW (1958a, p. 46, pl. VII, figs. 6—8).

Distribution: The holotype came from the condensed Bathonian of Swinitza (Romania). On the basis of the literature, the species seems to range within the Upper Bajocian and the Lower Bathonian. STURANI (1966, p. 20) regarded the species apparently in a wider sense, when dating it as ranging stratigraphically from the Middle Bajocian up to the Upper Oxfordian. All of the correctly recorded and figured specimens of this species were yielded by localities from the Tethyan region. At Gyenespuszta it ranges from Bed 16 to Bed 11, i.e. from the Subfurcatum to the Zigzag Zone.



Text-fig. 23. Whorl-section of *Adabofoloceras subobtusum* (J9221), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 24. Suture-line of *Adabofoloceras subobtusum* (J9220), VI/11, Zigzag Z.

The uppermost Bajocian beds of Profile III yielded an *Adabofoloceras* nucleus which measures: 20; 11 (55); 7 (36); 1 (5). The whorl-sides are flattened, the venter is highly arched. The flanks do not bear any longitudinal edge. On the venter there are fine, blunt, radial ribs. Despite its good state of preservation, the specimen could not be identified with any *Adabofoloceras* species figured with its younger whorls. It is figured here on Pl. V, fig. 1, as *Adabofoloceras* sp.

Adabofoloceras abichi (UHLIG, 1892)

Pl. V, fig. 2

1892. *Phylloceras Abichi* UHL. n. f. — NEUMAYR—UHLIG, p. 38, pl. I, fig. 2.
1894. *Phylloceras subobtusum* KUD. sp. — PARONA, p. 371, pl. I, fig. 1.
1898. *Phylloceras subobtusum* KUDERN. — STRÉMOOUKHOFF, p. 394, pl. II, fig. 5.
1914. *Phylloceras* aff. *subobtusum* KUD. — ZATWORNITZKY, p. 542, pl. XVI, fig. 1.
1937. *Phylloceras abichi* UHLIG — KAKHADZE, p. 128, pl. I, fig. 5.
1956. *Partschiceras abichi* UHL. — KAKHADZE—ZESASHVILI, p. 22, pl. II, figs. 4—6.
1958a. *Partschiceras abichi* UHLIG — BESNOSSOW, p. 40, pl. VII, figs. 1—2, text-fig. 15.
1963. *Partschiceras abichi* (UHLIG) — AZARIAN, p. 185, pl. VII, fig. 5. (only).
1969. *Partschiceras abichi* UHLIG — ROMANOV, p. 83, pl. II, figs. 1—3.
1970. *Partschiceras viator* (D'ORB.) — GALÁCZ, p. 123. (pars).
1971. *Partschiceras abichi* (UHLIG) — STURANI, p. 84, pl. 2, fig. 3, pl. 16, figs. 2—3.
1972. *Partschiceras abichi* (UHLIG) — PAVIA, p. 91, pl. 14, figs. 3, 7, pl. 15, fig. 7, text-fig. 2.

Material: A single, partly fragmentary internal mould.
Dimensions: J9223: 24; 14 (57); ?9 (?37.5); 1.5 (6)

Description: A small-sized young specimen. The umbilicus is narrow, funnel-shaped. The whorl-section is high-oval, with flattened whorl-sides. On the flanks there are two blunt spiral edges, thus the whorl-sides form a depression toward the umbilicus, their middle parts are flattened, and the outer thirds are convex and grade into the highly arched venter. The internal mould is smooth up to about 17 mm diameter, then appear simple, rectiradiate ribs on the venter. During the ontogeny the starting point of the ribs gradually sinks from the ventrolateral edges to below the outer third of the flanks. The specimen is septate up to 16 mm diameter, but the suture-lines are not decipherable.

Remarks: On the basis of studies on richer material by BESNOSSOW (1958a, pp. 40—42) and STURANI (1971, pp. 84—85), *Adabofoloceras abichi* can be easily distinguished from the other Bajocian and Bathonian species. It differs from the commonest allied species, *A. subobtusum*, in having a wider periumbilical depression and coarser ventral ribs. Another similar form is the Upper

Bathonian-Callovian *A. viator* (D'ORB.), but this latter lacks the lateral spiral edges and shows denser and longer ribs.

Distribution: *A. abichi* has been recorded exclusively from localities from the Tethyan province. Its occurrences are confined to the Upper Bajocian. At Gyenespuszta the specimen has been recovered from Bed 13, i.e. from the Parkinsoni Zone of the Upper Bajocian.

Genus CALLIPHYLLOCERAS SPATH, 1927

Type species, by original designation, is *C. disputabile* (ZITTEL, 1868a, p. 606 = *A. tatricus* KUDERNATSCH non PUSCH, 1852, p. 4, pl. I, figs. 1–4).

General remarks: The first description of *"Phylloceras" disputabile* is given by ZITTEL from 1869 (p. 63), but he designated this species under this name one year earlier (ZITTEL 1868a, p. 606). Therefore, the correct date of designation of this species is 1868. SPATH (1927–1933, p. 49) gave a detailed diagnosis for the *Calliphylloceras*. Precise analyses of the Middle Jurassic forms are given in NEUMAYR (1871), BESNOSSOW (1958a) and most recently in JOLY (1976).

Distribution: The earliest representatives of *Calliphylloceras* appear in the lowermost Liassic, and the genus endures throughout the Jurassic and Lower Cretaceous, with a disappearance in the Albian. Like all phylloceratids, *Calliphylloceras* is a characteristic Tethyan form. However, during the time spans of its greatest diversity (e.g. in the Toarcian and the Callovian), individuals invaded NW European areas.

Dimorphism: In accordance with the general situation in the Phylloceratina, *Calliphylloceras* also resists all attempts at recognizing dimorphic pairs. After some previous efforts (e.g. JULLIEN 1911, LÓCZY 1915), recently JOLY (1976, pp. 28–35) attempted at distinguishing intraspecific pairs in this genus. However, the parameters on which the dimorphism are based gave diminutive differences, so that transitions appear, and the separations seem to be rather inconclusive.

Calliphylloceras disputabile (ZITTEL, 1868)

Pl. V, figs. 3, 6, Text-figs. 25–29

1852. *Ammonites tatricus* PUSCH – KUDERNATSCH, p. 4, pl. I, figs. 1–4.
non 1867. *A. (Phylloceras) disputabilis* ZITT. – MENEGHINI, p. 98, pl. XX, fig. 1.
1868a. *Phylloceras disputabile* ZITT. (= *A. Tatricus* KUD. non PUSCH) – ZITTEL, p. 606.
1869. *Phylloceras disputabile* ZITT. – ZITTEL, p. 63.
1871. *Phylloceras disputabile* ZITTEL – NEUMAYR, p. 332, pl. XIV, fig. 7.
1872. *Phylloceras disputabile* ZITT. – GEMMELLARO, p. 177, pl. I, figs. 2–3.
?1875. *Phylloceras disputabile* ZITTEL – WAAGEN (1873–75), p. 31, pl. VI, figs. 1–3.
1881. *Phylloceras disputabile* ZITT. – BÖCKH, p. 19, pl. IX, figs. 1–4.
?1893. *Phylloceras disputabile* ZITT. – POMPECKJ, p. 182, pl. III, fig. 3.
1894. *Phylloceras slamisum* DE GREG. – PARONA, p. 373, pl. I, figs. 3–6.
1905. *Phylloceras disputabile* ZITT. – SIMIONESCU, p. 10. pl. I, figs. 2–4.
1905. *Phylloceras disputabile* ZITTEL – POPOVICI-HATZEG, p. 13, pl. II, figs. 1–9, text-figs. 3–5.
1910. *Phylloceras* cf. *Puschi* (OPP.) – TILL, p. 259, pl. XVI, fig. 8.
1915. *Phylloceras Demidoffi* ROUSSEAU – LÓCZY, p. 37, pl. I, fig. 2, pl. II, fig. 5, pl. III, fig. 1. (only)
?1916. *Phylloceras (Triphyllites) disputabile* ZITTEL – DOUVILLÉ, p. 11, pl. III, figs. 2–3, text-fig. 2.
non 1920. *Calliphylloceras* cf. *disputabile* (ZITTEL) – SPATH, p. 38, pl. V, fig. 4.
1935. *Phylloceras disputabile* ZITTEL – ROMAN, p. 20, pl. II, figs. 3–3a.
1935. *Phylloceras disputabile* ZITT. – PASSENDORFER, p. 12, pl. II, fig. 4, pl. III, fig. 1, text-fig. 2.
non 1951. *Calliphylloceras disputabile* ZITTEL sp. – JEANNET, p. 27, pl. 5, fig. 4, text-figs. 53–55.
1954. *Phylloceras heterophylloides* OPPEL – MIHAILOVIČ, p. 126, text-fig. 1.
1956. *Phylloceras demidoffi* ROUSSEAU – SACHARIEWA-KOWATSCHEWA, p. 249, pl. XVI, fig. 8.
?1956. *Calliphylloceras disputabile* (ZITT.) – KSIAZKIEWICZ, p. 189, pl. XXI, fig. 3, text-fig. 11.
1957. *Calliphylloceras disputabile* ZITT. – HIMSHIASHVILI, p. 25, pl. IV, fig. 3.
1958a. *Calliphylloceras disputabile* ZITTEL – BESNOSSOW, p. 23, pl. II, fig. 3, pl. III, fig. 1, text-figs. 2, 6. (only)
1958. *Calliphylloceras disputabile* ZITT. – COLLIGNON, pl. XII, fig. 61.
1959. *Calliphylloceras disputabile* ZITTEL – KASZAP, p. 264, pl. XI, fig. 2.
?1960. *Phylloceras disputabile* ZITTEL – RAILEANU–PELIN, p. 45, pl. I, fig. 2.
1961. *Calliphylloceras disputabile* ZITTEL – KRYMHOLZ, p. 26. pl. I, fig. 6.
1963. *Calliphylloceras disputabile* (ZITTEL) – AZARIAN, p. 182, pl. VII, figs. 1–3, text-figs. 46–47.
1964b. *Calliphylloceras disputabile* (ZITTEL) – STURANI, p. 10, pl. I, figs. 2, 5, text-fig. 5.
1964. *Calliphylloceras disputabile* (ZITTEL) – STANKEVICH, p. 12, pl. I, fig. 1.
1965. *Calliphylloceras disputabile* (ZITTEL, 1869) – RAKUS, p. 167, pl. X, fig. 1, text-fig. 1.
1968. *Calliphylloceras disputabile* (ZITTEL) – TSERETELI, p. 41, pl. I, fig. 2, pl. III, fig. 5.
1970. *Calliphylloceras disputabile* (ZITT.) – GALÁCZ, p. 123.
1971. *Calliphylloceras disputabile* (ZITTEL) – STURANI, p. 82, pl. 2, figs. 5, 6, 8.
?1971. *Calliphylloceras disputabile* ZITTEL – MAXIM et al., p. 409, pl. V, figs. 3–8.

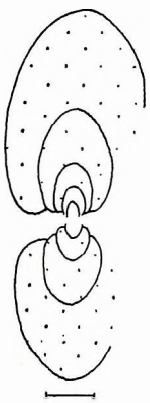
1972. *Calliphylloceras disputabile* (ZITTEL) — KRYSTYN, p. 217, text-fig. 5.
1973. *Calliphylloceras disputabile* (ZITTEL) — PAITSCHADZE, pl. I, figs. 2—3, pl. XXXIII, figs. 1—2.
1974. *Calliphylloceras disputabile* (NEUM.) — BARBULESCU, pl. XXXV, fig. 4.
1974. *Calliphylloceras disputabile* (ZITTEL, 1869) — MARCHAND—THIERRY, p. 484, pl. XIV, fig. 5.
1975. *Calliphylloceras* cf. *C. disputabile* (ZITTEL) — WESTERMANN, p. 38, pl. I, fig. 6.
1976. *Calliphylloceras disputabile* (ZITTEL) — JOLY, p. 199 and figures.

Material: 268 entire and fragmentary specimens of different state of preservation.

Dimensions:

J9228:	370;	210	(57);	160	(43);	17	(4.6)
	300;	175	(58);	98	(32);	10	(3.3)
	126;	71	(56);	43	(34);	8.5	(6.7)
	60.5;	35	(58);	21	(35);	4.5	(7.4)
	30;	15.5	(52);	11	(37);	3	(10)
J9224:	103;	59	(57);	38	(37);	6	(5.8)
J9227:	84;	47.5	(57);	39	(46);	8	(9.5)
	60;	32	(53);	20	(33);	8	(13.3)
	31;	16	(52);	12	(39);	3.5	(11.2)
	16;	9	(56);	6.5	(40);	2	(12.5)
J9229:	73;	41	(56);	33	(45);	7	(9.5)
J9225:	60.5;	35	(58);	26	(43);	5	(8.2)
J9226:	31;	16.5	(53);	12	(39);	5.5	(17.7)

Description: Medium-sized to relatively large specimens with characters somewhat varying during ontogeny. On inner whorls the umbilicus is relatively wide (11—15% or more), but the umbilical width tends to become, from about 50 mm diameter gradually smaller: its width on the larger specimens (about 300 mm) is only 3 to 4%. The umbilical wall is low and vertical, the flanks are generally strongly convex (Text-fig. 25), the greatest width can be measured near the lower third of the whorl-sides. The whorl-height values are rather constant (54—55% in average), those of the whorl-width vary between 30 and 40%. The venter is high and rounded. The internal mould is smooth. The constrictions are straight and prorsiradiate, then strongly swing forward over the outer third of the flanks and on the venter. The number of constrictions is 6 to 8, generally 7, per whorl. On the largest specimens the constrictions of the last whorls strongly fade away. In some specimens remains of the shell are visible. These show a fine, dense, prorsiradiate striation. On the internal moulds along the constrictions radial swellings appear, which are most conspicuous on the venter. The largest specimen is 370 mm in diameter and wholly septate. In smaller specimens the length of the preserved part of the body-chamber is 1/2 to 3/4 of a whorl.

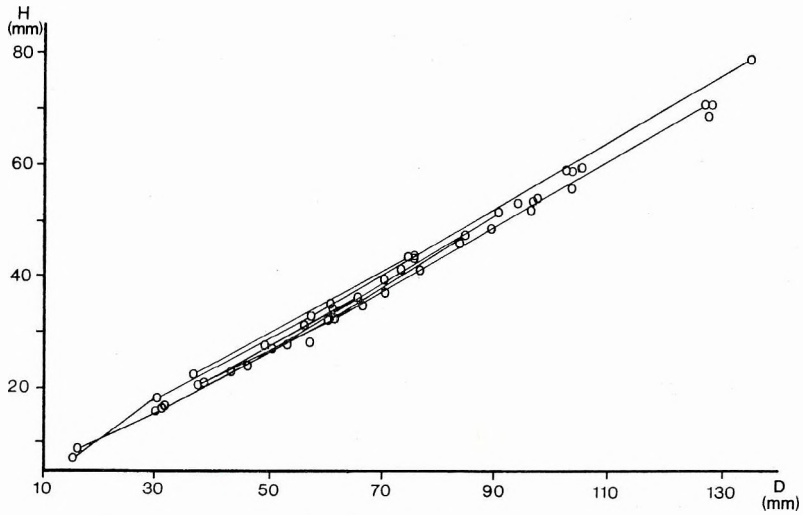


Text-fig. 25. Whorl-section of *Calliphylloceras disputabile* (J9227), VI/16, Subfurcatum and Garantiana Z.

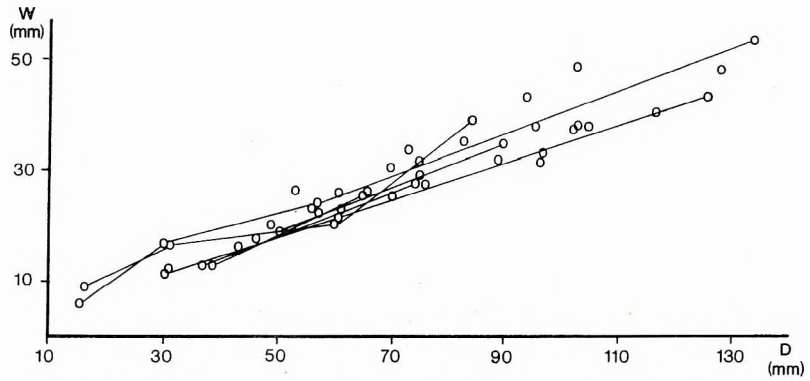
The suture-line (Text-fig. 29) is rather simple, with wide lobes and high saddles. The first lateral saddle ends in 3, other saddles in 2 leaflets.

Remarks: The nomenclature of the Middle Jurassic *Calliphylloceras* species have been discussed long ago. The first Middle Jurassic form was described by ROUSSEAU from the Crimea (1841, pl. I, fig. 4), under the name *Am. demidoffi*. D'ORBIGNY in 1845 united this form and some other ROUSSEAU specimens under the name *Am. tatricus*. It is worthy of mention, that, out of these forms, as observed by SPATH (1927—33, p. 52), *Am. huotiana* ROUSSEAU is a *Sowerbyiceras* and *Am. ponticuli* ROUSSEAU is a *Phylloceras* s.s. On the other hand, D'ORBIGNY's procedure was unfortunate too, because the name *Am. tatricus* had been introduced previously by PUSCH (1837, p. 158, pl. XIII, fig. 11) for a phylloceratid with folds on the venter (i.e. for a *Ptychophylloceras* in modern sense). In 1847 D'ORBIGNY (1842—51, p. 489, pl. 180, figs. 1—4) republished his previous figures, then with the name *Am. tatricus* PUSCH. KUDERNATSCH (1852, p. 4, pl. I, figs. 1—4) recognized, that the *Am. tatricus* of PUSCH and of D'ORBIGNY were two different forms, and because of the presence of ventral folds on his shelly Swinitza specimens, he gave them the name *Am. tatricus* PUSCH. OPPEL (1862—63, p. 216) also recognized the difference of the two forms, and he introduced the name *Am. manfredi* for specimens from the *Am. tatricus* PUSCH group, and renamed the form figured by D'ORBIGNY as *Am. puschi*. ZITTEL (1868a, p. 606) realized that the Swinitza specimens of KUDERNATSCH could not be identified either with the form of D'ORBIGNY, or with the species of PUSCH, therefore he named these *Phylloceras disputabile* (a very suitable name; see in ZITTEL 1869, p. 63). However, in this way the number of the names increased to five (regardless of the names *Am. ponticuli* and *Am. huotiana* of ROUSSEAU).

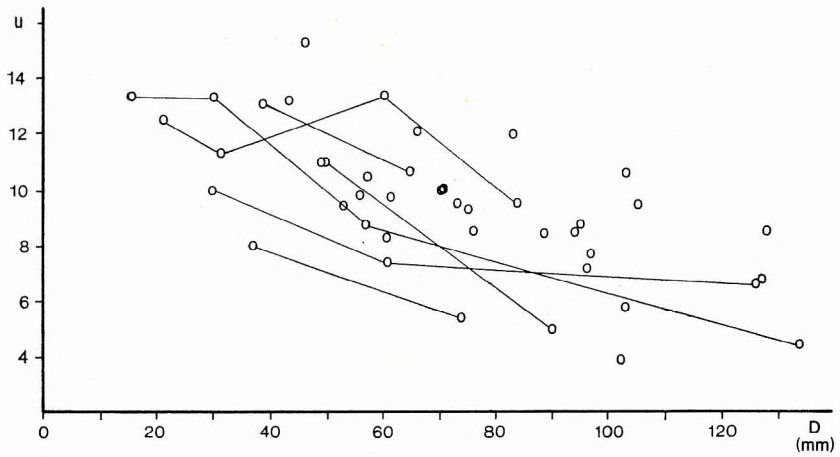
In his comprehensive treatment of *Phylloceras*, NEUMAYR (1871) made clear, that the use of the name *Am. tatricus* for this group was erroneous, and he put the species of PUSCH in another group ("Formenreihe"). Within this latter "*Phylloceras Capitanei* group" he dealt with the previously named and described species *(P. demidoffi, P. puschi, P. manfredi* and *P. disputabile)* separately. It is obvious from his discussions, that he could not make precise morphological distinctions between



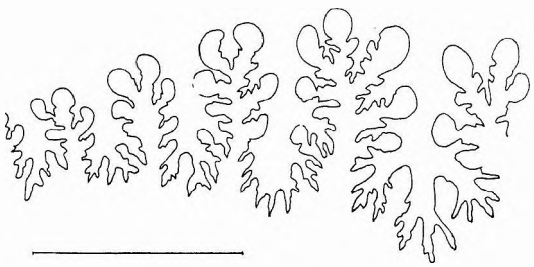
Text-fig. 26. Whorl-height plotted against diameter for specimens of *Calliphylloceras disputabile* from Gyenespuszta



Text-fig. 27. Whorl-width plotted against diameter for specimens of *Calliphylloceras disputabile* from Gyenespuszta



Text-fig. 28. Umbilical width percentages plotted against diameter for specimens of *Calliphylloceras disputabile* from Gyenespuszta



Text-fig. 29. Suture-line of *Calliphylloceras disputabile* (J9229), VI/16, Subfurcatum and Garantiana Z.

these four species, and he regarded their differences mainly on stratigraphic and distributional grounds. According to his views, *P. disputabile* is a Mediterranean Bathonian-Callovian form. *P. puschi* is a W European Lower Oxfordian one, and *P. manfredi* a W European Upper Oxfordian one. He regarded *P. demidoffi* as the Mediterranean counterpart of the latter two species.

Later LORIOL (1900, pp. 11—13) recognized that even the work of NEUMAYR (loc. cit. p. 336) showed the mistake of OPPEL when introducing the name *Am. puschi*. Namely, the figures of D'ORBIGNY show a *P. demidoffi* specimen, thus *Am. puschi* is a synonym of this latter. Therefore LORIOL introduced the name *Phylloceras lajouxensis* for the Oxfordian forms.

LÓCZY (1915, pp. 37—43) discussed the nomenclature of the species in question in detail. On the basis of his rich material from Villány, and studying the previous literature, he united all of these forms into a single species, and by virtue of priority, he used the name *Phylloceras demidoffi* ROUSSEAU. On the basis of his studied 121 specimens he did not find the previously counted morphologic features (e.g. width/height ratio, umbilical width, direction and number of the constrictions, suture-line) to be characteristic. As he demonstrated, these characters are highly variable, even within a single specimen.

In spite of the well-founded considerations, the use of different names has kept on until now. The reserve of *Calliphylloceras demidoffi* (ROUSSEAU) (syn.: *Am. puschi* OPPEL and *Am. lajouxensis* LORIOL) seems to be justified for some Middle and Upper Jurassic forms. As proposed with good reason, by SPATH (1927, p. 52) the figures of D'ORBIGNY (1842—51, pl. 180, figs. 1—2) could be regarded as type of this species characterised by the lack of any swelling or furrow on the shell above the constrictions of the internal mould. In some cases the figures of D'ORBIGNY are uncertain, it is true, but in these cases he mentioned this feature also in his description (loc. cit. p. 490). ARKELL (1940, pp. 141—142) considered this species as to be independent but later (1957, p. L189) he suggested its possible identity with *C. disputabile* (ZITTEL).

To take *C. demidoffi* to be an independent species unequivocally implies the independence of *C. disputabile*. This species comprises the Middle and Upper Jurassic forms, which show radial swellings on the test above the constrictions. This diagnostic feature was suggested by ZITTEL (1869, p. 64) already, however, as a species-characteristic feature it was mentioned only by subsequent authors (e.g. KRYSTYN 1972, p. 218). Consequently, the separation of the two species can be carried out only in the case of specimens with preserved test.

The validity of the species *C. manfredi* (OPPEL) remains doubtful. The type figures (OPPEL 1863, pl. 57, figs. 2. a-c) show an internal mould with fine radial striation in the upper part of the whorl-side and the venter. However, subsequent descriptions (e.g. DJANÉLIDZE 1933, p. 53) mention smooth internal casts. Only studies on the original material could decide whether this character enables to keep *C. manfredi* independent, or this form may be a synonym of *C. disputabile* (ZITTEL).

Some other problematic *Calliphylloceras* are also known from the Middle Jurassic. QUENSTEDT (1886—87, p. 616, pl. 73, fig. 9) based his *Am. heterophyllus ceramicus* on a single shell fragment showing suture-line portions. *Am. heterophyllus lautlingensis* (QUENSTEDT 1886—87, p. 759, pl. 86, fig. 23) is a well-preserved form, which is very closely related to *C. disputabile*. POMPECKJ (1893, pp. 182—184) referred both forms to the synonymy of *P. disputabile*, and pointed out, that the suture-line and whorl-section figures of QUENSTEDT are somewhat inaccurate. The type of *Calliphylloceras stenum* KAKHADZE and ZESASHVILI (1956, p. 19, pl. III, fig. 1, pl. IV, fig. 1) is a fragmentary body-chamber from the Middle Jurassic of the Kuban Valley (U.S.S.R.) and seems to belong to *C. disputabile*.

On the basis of the morphological features mentioned above, the form figured by MENEGHINI (1867, pl. XX, fig. 1) cannot be assigned to *C. disputabile*, but rather is a *Ptychophylloceras*, from the *P. tatricum* group (cf. NEGRI 1936, p. 42).

Of the figured specimens of LÓCZY (1915) those of pl. II, figs. 3—4 belong to *C. demidoffi*. The form referred by JEANNET (1951, p. 27, text-figs. 53—55, pl. 5, fig. 4) to *C. disputabile* from the Cordatus Beds of Herznach shows four constrictions without swellings on the test, therefore it belongs to another species. BESNOSSOW (1958a, p. 23) figured several specimens under the name *C. disputabile;* of these the specimens of pl. II, figs. 1 and 2 differ from the type in having ribs on the internal mould.

C. disputabile can be easily distinguished from the allied Middle Jurassic forms. *C. irganajense* BESNOSSOW (1958a, p. 20, pl. I, fig. 1) shows numerous and curved constrictions and a diphyllid first lateral saddle in the suture-line. *C. platilateralis* BESNOSSOW (1958a, p. 21, pl. I, fig. 2) has a compressed

whorl-section, straight and rectiradiate constrictions with associated swellings on the venter. This latter form shows a very close affinity to the species *C. achtalense* (REDLICH 1894, pl. III, fig. 10). Aalenian forms, such as *C. altisulcatum* et subspp. (PRINZ 1904) and *C. supraliasicum* et subspp. (POMPECKJ 1893) differ in having differences in the constrictions, whorl-section and umbilicus (see GÉCZY 1967, pp. 37—42). The whorls of *C. heterophylloides* (OPPEL) are inflated and the umbilicus is narrower in all stages of ontogeny (see STURANI 1964b, p. 11).

D i s t r i b u t i o n : *C. disputabile* ranges from the Bajocian Sauzei Zone up to the Callovian, but perhaps to the Oxfordian. It is a common element in Tethyan faunas of these ages. At Gyenespuszta it appears in all beds, from the Subfurcatum to the Upper Bathonian Retrocostatum Zone of Profiles I and VI.

Genus HOLCOPHYLLOCERAS SPATH, 1927

G e n o t y p e : SPATH (1927—33, p. 56) designated *P. mediterraneum* NEUMAYR (1871, p. 342, pl. XVII, fig. 2) as the type of this genus, but this name is a synonym of *Am. zignodianum* D'ORBIGNY (1842—51, p. 493, pl. 182) (see below).

G e n e r a l r e m a r k s : In his diagnosis of this genus, SPATH (loc. cit.) emphasized the features of the constrictions as characteristic, and, in fact, on this basis the genus is easily distinguishable. More or less similar constrictions appear on certain *Sowerbyiceras* species, therefore misidentifications of some *Holcophylloceras* inner whorls, such as *Sowerbyiceras*, are common in the literature. This similarity is reflected in some taxonomic procedures regarding *Holcophylloceras* as a subgenus of *Sowerbyiceras* (see e.g. WIEDMANN 1963, p. 166). However, the differences of those two groups seem to be sufficient for maintaining *Holcophylloceras* as an independent genus.

D i s t r i b u t i o n : Earliest *Holcophylloceras* species (*H. ultramontanum* group) appear in the Toarcian, and the last representatives endure up to the Lower Cretaceous Aptian. This genus yields the most characteristic elements of the Mediterranean Upper Liassic, Middle and Upper Jurassic and Lower Cretaceous ammonite faunas, from almost all Tethyan localities.

D i m o r p h i s m : Some author tried to recognize dimorphism within certain species of this genus (e.g. in *H. zignodianum:* LÓCZY 1915; BESNOSSOW 1958a; *H. indicum* JOLLY 1976; etc.). However, these attempts revealed inconclusive results (see below).

Holcophylloceras zignodianum (D'ORBIGNY, 1848)

Pl. V, figs. 4—5, Pl. VI, fig. 1, Pl. VII, fig. 1, Text-figs. 30—32

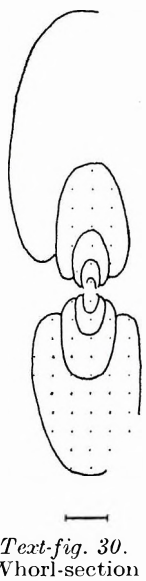
1848. *Ammonites Zignodianus* D'ORB. — D'ORBIGNY (1842—51), p. 493, pl. 182, figs. 1—3.
1856. *Ammonites zignodianus* — VILANOVA, pl. I, fig. 7.
1871. *Phylloceras Zignoanum* D'ORB. sp. — NEUMAYR, p. 339, pl. XVII, fig. 1.
1871. *Phylloceras mediterraneum* nov. sp. — NEUMAYR, p. 340, pl. XVII, figs. 2—5.
?1875. *Phylloceras mediterraneum* NEUM. — WAAGEN (1873—75), p. 34, pl. V, figs. 1. a-b, pl. VII, figs. 3. a-c.
1876. *Ammonites (Phylloceras) mediterraneus* NEUMAYR — FAVRE, p. 33, pl. II, fig. 12.
1881. *Phylloceras Zignoanum* D'ORB. sp. — BÖCKH, p. 25, pl. X, fig. 3.
1890. *Phylloceras mediterraneum* NEUM. — HAUG, p. 328, pl. IV.
1892. *Phylloceras mediterraneum* NEUM. — NEUMAYR—UHLIG, p. 35, pl. I, fig. 1.
1893. *Phylloceras Frederici Augusti* — POMPECKJ, p. 185, pl. II, figs. 12—14.
1893. *Phylloceras* sp. cf. *mediterraneum* NEUMAYR — POMPECKJ, p. 187, pl. II, fig. 15.
1894. *Phylloceras subpartitum* PAR. — PARONA, p. 372, pl. I, figs. 2. a-c.
1894. *Phylloceras (?) Julii* n. sp. — PARONA, p. 374, pl. I, figs. 7—9.
1895. *Phylloceras Deslongchampsi* nov. sp. — BRASIL, p. 29, pl. I, figs. 6—8.
1898. *Phylloceras Zignodianum* D'ORBIGNY — STRÉMOOUKHOFF, p. 389, pl. I, figs. 1—5.
1899. *Phylloceras mediterraneum* NEUM. — SIMIONESCU, p. 200, pl. II, fig. 2. (non fig. 5!).
1900. *Phylloceras Zignoi* D'ORBIGNY — LORIOL, p. 15, pl. II, figs. 1011, text-fig. 2.
non 1904. *Phylloceras mediterraneum* NEUM. — PRINZ, p. 44, pl. VII, fig. 2, pl. XXXVI, fig. 8.
1905. *Phylloceras mediterraneum* NEUMAYR — LEE, p. 63, pl. II, fig. 11.
1905. *Phylloceras mediterraneum* NEUM. — POPOVICI-HATZEG, p. 14, pl. III, figs. 1—7, text-fig. 6.
1905. *Phylloceras mediterraneum* NEUM. — SIMIONESCU, p. 5, pl. I, fig. 10.
1909. *Phylloceras* aff. *Zignoanum* D'ORB. — RENZ, p. 254, pl. I, fig. 7.
1910. *Phylloceras Zignoi* ORB. var. *Nausikaae* RENZ (nov. var.) — RENZ, pl. XX, fig. 4.
?1910. *Phylloceras mediterraneum* NEUMAYR, race *indica* PAUL LEMOINE — LEMOINE, p. 3, pl. I, fig. 1.
1910. *Phylloceras* sp. du groupe de *Ph. mediterraneum* NEUMAYR — LEMOINE, p. 4, pl. I, fig. 4.
1911. *Phylloceras Zignoi* D'ORBIGNY sp. — FLAMAND, p. 887, pl. IV, fig. 5.
1915. *Phylloceras Zignodianum* D'ORB. = *Phyll. Mediterraneum* NEUM. — LÓCZY, p. 43, pl. XIV, figs. 6—7, text-figs. 22—27.
1916. *Phylloceras (Triphyllites) mediterraneum* NEUMAYR — DOUVILLÉ, p. 12, pl. III, fig. 1.
1924. *Phylloceras Zignoi* D'ORBIGNY — ROMAN, p. 45, pl. I, figs. 10, 10a.
1924. *Phylloceras mediterraneum* NEUMAYR — ROMAN, p. 45, text-fig. 9; p. 87, pl. VII, fig. 1.

1927. *Holcophylloceras mediterraneum* (NEUMAYR) — SPATH (1927—33), p. 58, pl. V, fig. 1.
1931. *Phylloceras mediterraneum* NEUMAYR — FLORIDIA, p. 97, pl. III, fig. 3.
1933. *Phylloceras Zignoi* D'ORBIGNY — ROMAN, p. 61, pl. II, figs. 2, 2a.
1935. *Phylloceras mediterraneum* NEUMAYR — ROMAN, p. 29, pl. II, fig. 4; pl. IV, figs. 6. 6a.
1935. *Phylloceras Zignoi* D'ORB. — PASSENDORFER, p. 8, pl. II, fig. 6, text-fig. 1.
1937. *Phylloceras mediterraneum* NEUM. — KAKHADZE, p. 127, pl. II, fig. 2.
non 1937. *Phylloceras* aff. *Zignoi* D'ORB. — KAKHADZE, p. 27, pl. II, fig. 1.
1939. *Phylloceras Zignodianum* (D'ORB.) — RAMACCIONI, pl. XIII, fig. 8.
1951. *Holcophylloceras Zignodianum* D'ORB. sp. — JEANNET, p. 28, pl. 5, fig. 7.
1956. *Calliphylloceras (Holcophylloceras) zignoi* (D'ORB.) — KSIAZKIEWICZ, p. 188, pl. XXI, fig. 1. text-fig. 9.
1956. *Holcophylloceras zignoi* D'ORB. — KAKHADZE—ZESASHVILI, p. 20, pl. I, fig. 6.
1956. *Phylloceras zignodianum* D'ORB. — SACHARIEWA-KOWATSCHEWA, p. 248, pl. III, fig. 4.
1957. *Holcophylloceras mediterraneum* NEUM. — HIMSHIASHVILI, p. 33, pl. IV, figs. 8—10.
?1958. *Holcophylloceras mediterraneum* NEUM. — COLLIGNON, pl. VIII, fig. 40.
?1958a. *Holcophylloceras zignodianum* ORBIGNY — BESNOSSOW, p. 54, pl. IX, figs. 1—3, pl. X, figs. 1—2, pl. XV figs. 1—3, text-fig. 23, 25.
1959. *Holcophylloceras mediterraneum* (NEUMAYR) = *? zignodianum* (D'ORBIGNY) — SAPUNOV—NACHEV, p. 51, pl. II, fig. 5.
1959. *Holcophylloceras mediterraneum* (NEUM.) — KASZAP, p. 264, pl. X, figs. 1—4.
1960. *Holcophylloceras mediterraneum* (NEUMAYR) — RAILEANU—NASTASEANU, p. 14, pl. I, fig. 6.
1960. *Phylloceras mediterraneum* NEUM. — RAILEANU—PELIN, p. 45, pl. I, fig. 3.
1960. *Calliphylloceras (Holcophylloceras) mediterraneum* (NEUMAYR) — CHRIST, p. 60, pl. 2, figs. 5—6.
1962. *Holcophylloceras mediterraneum* (NEUMAYR, 1871) — RAKUS, p. 144, pl. XI, fig. 1, text-fig. 1.
1963. *Holcophylloceras mediterraneum* (NEUMAYR) — AZARIAN, p. 176, pl. VI, figs. 1—2.
?1963. *Holcophylloceras mediterraneum* (NEUM.) — PREDA, p. 79, pl. VII, figs. 1.
1964b. *Holcophylloceras mediterraneum* (NEUMAYR) — STURANI, p. 11, pl. I, figs. 4, 6, text-fig. 6.
1964. *Holcophylloceras zignodianum* (D'ORBIGNY) — STANKEVICH, p. 13, pl. I, figs. 2. a-b.
1966. *Holcophylloceras mediterraneum* (NEUMAYR) — STURANI, p. 22, pl. 3, figs. 5—6, pl. 5, fig. 5.
1968. *Holcophylloceras zignodianum* (ORBIGNY) — TSERETELI, p. 51, pl. II, figs. 3—4.
1970. *Holcophylloceras mediterraneum* (NEUM.) — GALÁCZ, p. 123.
1971. *Holcophylloceras mediterraneum* (NEUM.) — MAXIM et al., p. 412, pl. VIII, figs. 1—4.
1971. *Holcophylloceras ultramontanum* (NEUMAYR) — MAXIM et al., p. 412, pl. VIII, figs. 5—7.
1971. *Holcophylloceras mediterraneum* (NEUMAYR) — STURANI, p. 83, pl. 2, figs. 7, 9, 10, pl. 16, fig. 4.
1973. *Holcophylloceras zignodianum* (ORBIGNY) — PAITSCHADZE, p. 93, pl. II, figs. 3—4, pl. III, fig. 1, pl. XXXIII, figs. 6—7.

Material: 604 specimens.

Dimensions:				
J9230:	170;	92 (54);	60 (35);	19 (11.1)
J9231:	88;	47 (53);	29 (33);	10 (11.3)
J9232:	77;	39.5 (51);	25 (32);	11 (14.2)
J9233:	42;	22.5 (53.5);	14 (33);	6 (14.2)

Description: Generally medium-sized species with the occurrence of some large specimens. The umbilicus is relatively wide (> 15%) on the nucleus, but somewhat narrower (usually 11—12%) on the outer whorls. The umbilical wall is high and vertical, the umbilical edge is slightly rounded. The whorl-sides are convex on the inner whorls, but somewhat flattened on the outer whorls (Text-fig. 30). The venter is wide and low, sometimes depressed, especially on the outer whorls. The whorl-section is compressed-oval, with rounded ventrolateral edges. The maximal thickness lies between the middle and the lower third of the flanks. The ornamentation is simple, and usually visible only on the test. It consists of prorsiradiate, thick ribs of variable strength and length on the middle and outer whorls. The constrictions represent weak furrows on the shell, but stronger depressions on the internal mould. Their form is characteristic, with a sharp break near the outer third of the whorl-sides, where a lip-like, forward extension is visible, especially in larger specimens. The constrictions cross the venter radially. No entire specimen is present in this material, thus the length and the aperture of the body-chamber cannot be studied.



Text-fig. 30. Whorl-section of *Holcophylloceras zignodianum* (J9234), VI/16, Subfurcatum and Garantiana Z.

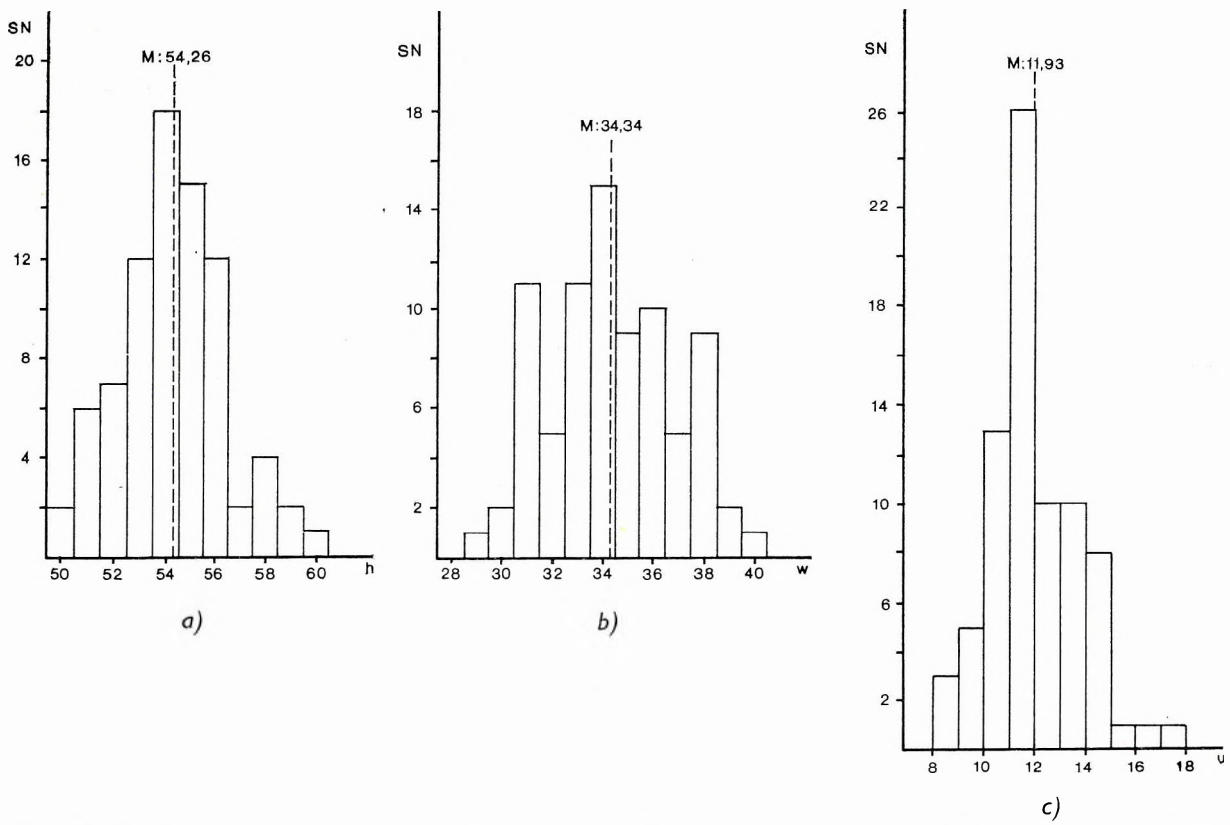
The suture-line is relatively simple (Text-fig. 31). E shallow and wide, L deeper and three-pronged. The second lateral lobe is shorter, three-pronged, other lobes are two-pronged. The first lateral saddle is diphyllic, the second lateral saddle is triphyllic in the majority of the specimens. In some cases the second lateral saddle is clearly diphyllic, and, in some larger specimens, a quadriphyllic second lateral saddle appears.

Remarks: The species *Am. zignodianus* was described by D'ORBIGNY in 1848 (in 1842—51, p. 493, pl. 182). For his figured specimen he gave the drawing of a suture-line with a diphyllic second lateral saddle. Subsequently, NEUMAYR (1871, p. 340, pl. XVII, figs. 2—5) introduced the name *Phylloceras mediterraneum* for the common Alpine Middle and Upper Jurassic forms of the *Am. ultramontanum* group (i.e. *Holcophylloceras* genus). NEUMAYR emphasized the triphyllid ending of the first lateral saddle (second lateral, in the modern sense) as most important

distinctive feature. In connection with his studies on Middle Jurassic phylloceratids from the Crimea, STRÉMOOUKHOFF published in 1898 the photographs of the *Ammonites zignodianus* specimens from the D'ORBIGNY collection (pl. I, figs. 1. a-g). In the description he called attention to the partly triphyllid (figs. 1. b and d) and partly diphyllid (figs. 1. c, e, f and g) second lateral saddles in the suture-lines of the specimens. According to STRÉMOOUKHOFF, the specimen of fig. 1. a is a transition between the two types. The inference that STRÉMOOUKHOFF failed to draw is that *Phylloceras mediterraneum* of NEUMAYR is a younger synonym of D'ORBIGNY's species. However, this form has been referred in the literature generally as *P. mediterraneum*. On the basis of a large collection from the Villány Callovian, LÓCZY (1915) studied the species in detail. He recognized two, three, as well as four leaflets on the second lateral saddles in his more than a hundred determined specimens. He found examples, which even showed diphyllid second lateral saddles with preceding and succeeding triphyllid ones. He regarded these as "intercalated" suture-lines ("Einschaltungsloben"). LÓCZY discussed also the nomenclatural confusion of this species, and he suggested that D'ORBIGNY's suture-line drawing had been derived not from that specimen figured in pl. 182, figs. 1—2, but possibly from a *P. ultramontanum* specimen. To decide this latter problem needs a close and careful study of the originals, but LÓCZY's including *P. mediterraneum* NEUMAYR in the synonym of *P. zignodianum* (D'ORBIGNY) is justified. In spite of the fact that the monograph of LÓCZY is one of the best-known works on Middle Jurassic ammonites, the incorrect usage of the name *H. mediterraneum* in the literature has remained universal. The confusion was probably improved by ARKELL (1957, p. L189), gave *P. mediterraneum* as the type species of genus *Holcophylloceras* and quoted *P. zignodianum* as a synonym. He did not recognize the priority of the latter and the necessary procedure what it involves (see e.g. WENDT 1964, pp. 114—115).

Text-fig. 31. Suture-line of *Holcophylloceras zignodianum* (J9235), VI/3, Subcontractus Z.

The majority of the numerous specimens from the Gyenespuszta material bears a triphyllid second lateral saddle. However, some specimens show diphyllic endings in accordance with the observations of STRÉMOOUKHOFF and LÓCZY mentioned above. Therefore, according to the law of



Text-fig. 32. Frequency distributions of the whorl-height (a), whorl-width (b) and umbilicus (c) for specimens of *Holcophylloceras zignodianum* from Gyenespuszta

priority, the commonly used name *Holcophylloceras mediterraneum* should be rejected, and the name *H. zignodianum* (D'ORBIGNY) preferred.

LÓCZY (1915, pp. 44—49), in his rich material from Villány, distinguished four infraspecific varieties ("A—D Varietäten") on the basis of the shape of the cross-section and the features of the constrictions. He interpreted these phenomena as sexual differences. BESNOSSOW (1958a, p. 55), again on the basis of the whorl-section, distinguished "male" and "female" specimens. However, the differences seem to be rather extreme within a single species of variable morphologic features. The evaluation of the dimensions of more than 70 specimens from Gyenespuszta (Text-fig. 32) does not enable us to distinguish morphological differences of two or more groups. Whorl-width and whorl-height are rather variable on the middle and outer whorls (29 to 40 and 50 to 60%, respectively), while the umbilical width seems to be constant, 11—12% in average.

H. zignodianum differs clearly from other Middle Jurassic *Holcophylloceras* species. The Aalenian *H. ultramontanum* (ZITTEL) and its subspecies are forms with a narrower umbilicus, a complex suture-line and a mainly diphyllic or "subtriphyllic" second lateral saddle (see in GÉCZY 1967). The Middle Aalenian *H. tintanti* GÉCZY shows a rounded whorl-section and a diphyllic second lateral saddle. The Upper Bathonian *H. marioni* (MUNIER-CHALMAS) bears more constrictions (cf. STURANI 1966, pp. 21—22).

Distribution: *H. zignodianum* is perhaps the most characteristic, or certainly the most common, Tethyan Middle Jurassic ammonite. It shows a very wide geographic distribution, with records from almost all Tethyan faunas. Its vertical range is wide too, i.e. from the Middle Bajocian (Sauzei Zone) up to the Upper Jurassic. At Gyenespuszta, *H. zignodianum* is the most common ammonite species, occuring in all beds of the profiles studied.

Genus PTYCHOPHYLLOCERAS SPATH, 1927

Type species, by original designation (SPATH 1927—33, p. 41), "*Phylloceras*" *feddeni* WAAGEN (1873—75, p. 217, pl. VII, figs. 1. a-c).

General remarks: *Ptychophylloceras* units a well-differentiated group of phylloceratids, which was precisely delimited by SPATH in his diagnosis. Recently BESNOSSOW (1957) separated from this long-established genus a group under the name *Tatrophylloceras*. In his diagnosis and generic description (BESNOSSOW 1958a, pp. 27—29) he emphasized as characteristic features the constriction-free inner whorls and the funnel-shaped, narrow umbilicus of the *Tatrophylloceras*. However, SPATH (loc. cit.) in his diagnosis mentioned the constrictions as of occasional feature, and in fact, their appearance may be individually variable even in a single species. Concerning the character of the umbilicus, it is funnel-shaped practically in all *Ptychophylloceras* species, and its width is a rather specific feature within the phylloceratids. Consequently, the separation of *Tatrophylloceras* seems to be rather unjustified.

Distribution: The earliest *Ptychophylloceras* species [*P. tatricum* (PUSCH)] came from the Toarcian. The genus becomes most differentiated in the Middle Jurassic and is represented by some species in the Late Jurassic and Early Cretaceous. Youngest *Ptychophylloceras* representatives appear in the Aptian. This is a strictly Tethyan genus, recorded only from Mediterranean localities.

Dimorphism: In connection with *Ptychophylloceras*, no studies on dimorphism have been carried out so far.

Ptychophylloceras triplicatum n. sp.

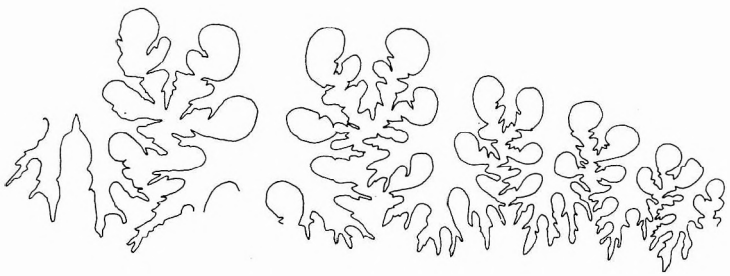
Pl. VIII, figs. 1, 3, Text-figs. 33—34

Holotype: Pl. VIII, figs. 1. a-b; J9236.
Locus typicus: Gyenespuszta, Northern Bakony, Transdanubian Central Mountains, Profile VI.
Stratum typicum: Bed 13, Upper Bajocian (Parkinsonia parkinsoni Zone); ammonitico rosso limestone.
Derivatio nominis: *triplicatus* (Lat.)=three-folded; i.e. after the labial ridges appearing in threes on the venter.
Diagnosis: *Ptychophylloceras* with flattened whorl-sides on the middle whorls, with triplicate labial ridges on the venter of the middle and outer whorls, which become dense, coarse outer ribs near the aperture.
Material: Beside the holotype, two relatively well-preserved, and 7 fragmentary internal moulds.

Dimensions: J9238:	139;	73 (62.5);	49 (35);	17 (12.1)
	102;	54 (53);	40 (39);	15 (14.4)
Holotype, J9236:	109;	59 (54);	42 (38.5);	12 (11)
	84;	47 (56);	38 (45);	10.5 (12)
J9237:	94;	53 (56);	39 (41.5);	10.5 (10.8)

Description: The holotype is a relatively large specimen. The umbilicus is wide, but somewhat exaggerated, judging by traces of solution around the umbilical seam. The umbilical area is depressed, funnel-shaped, the whorl-sides are somewhat flattened on the phragmocone, but convex on the body-chamber. The venter is high, regularly arched. The whorl-section (Text-fig. 33) is compressed on the septate whorls and rounded on the body-chamber, with maximal thickness at the middle of the flanks. The periumbilical rosette, which is characteristic of certain *Ptychophylloceras* species cannot be seen, but its presence is possible on the inner whorls. The venter of the middle and the outer whorls bears prominent, slightly arched "labial" ridges, which appear in triplets. A complete whorl shows 8 tripled ventral folds. The ventral folds vanish towards the flanks, and reach not more than the outer third of the whorl-sides. These ventral folds become denser, forming slightly pror-

Text-fig. 33. Whorl-section of *Ptychophylloceras triplicatum* n. sp. (J9237), VI/13, Parkinsoni Z.



Text-fig. 34. Suture-line of *Ptychophylloceras triplicatum* n. sp. Holotype (J9236), VI/13, Parkinsoni Z.

siradiate, coarse outer ribs in the anterior part of the body-chamber. The septation ceases at about 70—80 mm diameter, the length of the body-chamber on the largest specimen (holotype) is 3/4 of a whorl. Aperture not preserved.

The suture-line (Text-fig. 34) is similar to that of *P. euphyllum*. The first lateral saddle is diphyllic with a poor tendency to be "subtetraphyllic", the second lateral is triphyllic, while the other saddles end in two leaflets.

Remarks: *P. triplicatum* differs from all the other known congeneric forms in having the triple folds on the ventral side of the internal mould. In some previously known forms the labial ridges are occasionally doubled (e.g. in the holotype of *P. euphyllum*, NEUMAYR 1870, pl. XXIII, fig. 1. a), but the regularity shown in this new species is unique. Similarly, a special character is the outer ribbing of the anterior part of the body-chamber. The latter feature recalls the ribbed body-chamber of some *Adabofoloceras* species.

Distribution: 9 of the collected 10 *P. triplicatum* specimens came from Bed 13 of Profile VI of Gyenespuszta and a single specimen was yielded by Bed 14, also of the Parkinsoni Zone. Accordingly, this new species narrows the apparent gap that existed previously between the Aalenian *Ptychophylloceras* species [e.g. *P. tatricum* (PUSCH), *P. chonomphalum* (VACEK)] and the Upper Bathonian to Callovian forms [*P. flabellatum* (NEUMAYR), *P. euphyllum* (NEUMAYR), *P. feddeni* (WAAGEN), etc.]. Recently, BESNOSSOW (1958a, pp. 30—32) has described "*Tatrophylloceras*" (= *Ptychophylloceras*) *xeniosulcatum* from the Upper Aalenian and "*Tatrophylloceras*" (= *Ptychophylloceras*) *subglobosum* from the Lower Bajocian, while STURANI (1971, p. 88) has introduced an other new form (*P. longarae*) from the Upper Bajocian. In this way, the *Ptychophylloceras* lineage has became documented continuously from Upper Liassic up to the Lower Cretaceous.

Ptychophylloceras flabellatum (NEUMAYR, 1871)

Pl. VI, figs. 2—3, Pl. VII, fig. 2, Text-figs. 35—36

1856. *Ammonites Hommairei* — VILANOVA, pl. I, fig. 6.
1871. *Phylloceras flabellatum* nov. sp. — NEUMAYR, p. 323, pl. XV, fig. 5, pl. XVI, figs. 4—6.
1872. *Phylloceras euphyllum* NEUM. — GEMMELLARO, p. 172, pl. II, figs. 1—2.
1881. *Phylloceras flabellatum* NEUM. — BÖCKH, p. 15, pl. IX, fig. 7.

1890. *Phylloceras flabellatum* NEUM. — JÜSSEN, p. 388, pl. 2, fig. 2.
1905. *Phylloceras flabellatum* NEUM. — SIMIONESCU, p. 7, pl. I, figs. 8—9, text-fig. 4. (only).
1905. *Phylloceras flabellatum* NEUM. — POPOVICI-HATZEG, p. 12, pl. I, figs. 5—7, 10—11, pl. IV, fig. 9, text-figs. 1, 2.
1915. *Phylloceras flabellatum* NEUM. — LÓCZY, p. 259, pl. I, fig. 4, pl. II, fig. 1, text-fig. 11.
1924. *Phylloceras Hommairei* D'ORBIGNY — ROMAN, p. 87, pl. VII, fig. 4.
1933. *Phylloceras flabellatoides* sp. n. — DJANÉLIDZE, p. 8, pl. I, fig. 1, text-fig. 3.
?1933. *Phylloceras flabellatum* NEUMAYR — CHIKHACHEV, p. 83, pl. IV, fig. 4.
1935. *Phylloceras flabellatum* NEUM. — PASSENDORFER, p. 9, pl. III, fig. 2.
1956. *Phylloceras flabellatum* NEUM. — SACHARIEWA-KOWATSCHEWA, p. 248, pl. VIII, fig. 2.
1957. *Ptychophylloceras flabellatoides* DJAN. — HIMSHIASHVILI, p. 30, pl. IV, figs. 6—7.
non 1958. *Ptychophylloceras flabellatum* NEUM. — COLLIGNON, pl. XXI, fig. 85.
1959. *Ptychophylloceras flabellatum* NEUM. — KASZAP, p. 264, pl. IX, fig. 6.
non 1960. *Phylloceras flabellatum* NEUM. — RAILEANU—PELIN, p. 44, pl. I, fig. 1.
1961. *Ptychophylloceras flabellatum* (NEUM.) — HIMSHIASHVILI, p. 151, pl. I, fig. 1.
1963. *Ptychophylloceras flabellatum* (NEUM.) — PREDA, p. 78, pl. VI, fig. 5.
1966. *Ptychophylloceras flabellatum* (NEUMAYR) — STURANI, p. 21, pl. 3, fig. 4, pl. 5, fig. 4.
1967. *Calliphylloceras (Ptychophylloceras) flabellatum* (NEUMAYR 1871) — KUNZ, p. 272, pl. 2, fig. 1.
1969. *Ptychophylloceras feddeni* WAAGEN — MIHAILOVIČ, p. 59, pl. II, fig. 1.
1970. *Ptychophylloceras flabellatum* (NEUM.) — GALÁCZ, p. 123.
1970. *Ptychophylloceras euphyllum* (NEUM.) — GALÁCZ, p. 123.
non 1971. *Calliphylloceras flabellatum* NEUM. — MAXIM et al., p. 411, pl. VII, figs. 3—4.
1971. *Ptychophylloceras feddeni* WAAG. — MAXIM et al., p. 411, pl. VII, figs. 5—6.
non 1972. *Phylloceras flabellatum* NEUM. — BARFÉTY et al., pl. II, fig. 10.
1973. *Ptychophylloceras flabellatum* (NEUMAYR) — PAITSCHADZE, pl. I, figs. 4. a-b, pl. XXXIII, fig. 3.
1974. *Ptychophylloceras flabellatum* (NEUM.) — BARBULESCU, p. 126, pl. XXIV, figs. 4—5, pl. XXXV, figs. 2—3.
1976. *Ptychophylloceras flabellatum* (NEUMAYR) — JOLY, p. 278, and figures.

Material: 31, partly fragmentary, partly subsolved specimens, without traces of shell.

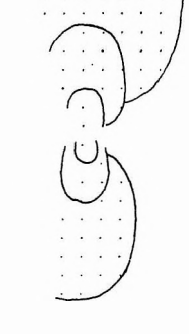
Dimensions:

J9239:	112;	61 (54);	47 (42);	12 (10.7)
J9242:	108;	61 (56);	44 (41);	12 (11.1)
J9244:	90;	48.5 (54);	37 (41);	12 (13.3)
J9243:	70.5;	37 (52);	30 (43);	8 (11.3)

Description: Medium-sized, robust form with funnel-shaped umbilicus, which tends to become narrower during ontogeny. The figured forms are the smallest and largest specimens (Pl. VI, figs. 2—3) from Gyenespuszta, with 12.9 and 10.7% umbilical width, respectively. The whorl-section (Text-fig. 35) is wide-oval, with oblique umbilical walls, slightly convex flanks, a rounded ventrolateral edge and a wide, low venter. Maximal whorl-thickness can be measured at the middle of the flanks. The internal moulds show only the periumbilical, strongly prorsiradiate, slender constrictions (rosette), which can be traced up to the middle of the whorl-sides. Some larger, fragmentary specimens preserve the characteristic, forwards-arched labial ridges (Pl. VI, fig. 3).

The largest specimens are septate up to 100—110 mm diameter, but the entire body-chamber cannot be seen even in these.

The suture-line (Text-fig. 36) shows the characteristic phylloceratid pattern. The saddles end in two leaflets, commonly with the further division of the second lateral saddle (i.e. with the appearance of the "subtetraphyllid" feature). The leaflets in the saddles are characteristically rounded.



Text-fig. 35. Whorl-section of *Ptychophylloceras flabellatum* (J9242), VI/1, Retrocostatum Z.

Text-fig. 36. Suture-line of *Ptychophylloceras flabellatum* (J9245), VI/8, Progracilis Z.

Remarks: *Ptychophylloceras flabellatum* was described by NEUMAYR (1871, p. 323) from the Swinitza material. According to the original description, *P. flabellatum* is distinguished by its wide whorl-section, periumbilical rosette, short and widely spaced ventral ridges (7 to 8 per whorls), and by the rounded leaflets in the second lateral saddle. In *P. tatricum* (PUSCH) the periumbilical constrictions are absent, but the labial ridges reach down to the lower third of the whorl-sides. These latter features are shown by the specimen described by BARFÉTY et al. (1972), thus it cannot be assigned to *P. flabellatum*. A similar form is *P. euphyllum* (NEUMAYR 1870, p. 553), but it differs in having higher whorl-section and more ventral ridges. The main difference is in the suture-line, which shows in *P. euphyllum* 3 slender leaflets on the second lateral saddle. This triphyllid ending is shown by the specimen of COLLIGNON (1958, pl. XXI, fig. 85). Also on the basis of other features, this latter specimen belongs rather to the species *P. euphyllum* (see JOLY 1976, p. 265). The small specimen of CHIKHACHEV (1933, pl. IV, fig. 4) shows the joints of the periumbilical rosette and the ventral ridges in similar fashion as on the *P. euphyllum* specimen figured in BÖCKH (1881, pl. IX, fig. 5) from the Mecsek Mts (South Hungary). *P. flabellatum* and *P. feddeni* are closely allied forms (c.f. SPATH 1927—33, pp. 41—42), but the latter seems to be confined to the Oxfordian (see LEMOINE 1910, p. 6). Despite the very poor quality of the figures, the forms described as *P. feddeni* from the Swinitza area (MIHAILOVIČ 1969, pl. II, fig. 1; MAXIM et al. 1971, pl. VII, figs. 5—6) seem to be topotypes of *P. flabellatum*. On the other hand, the specimen figured by MAXIM et al. (loc. cit., pl. VII, figs. 3—4) as "*Calliphylloceras flabelatum*" (sic!) seems to belong to *Calliphylloceras disputabile*. DJANÉLIDZE (1933, p. 8, pl. I, fig. 1), for his *Ptychophylloceras* specimens from the Caucasus, introduced a new specific name *(P. flabellatoides)*, designating the rounded shape of the whorl-section as a characteristic feature. However, on the basis of the Gyenespuszta material too, this character cannot be regarded as being of specific value.

Distribution: This common Tethyan species appears mainly in the Bathonian and the Lower Callovian. The type came from the condensed Lower and Middle Bathonian of Swinitza. In the Gyenespuszta material this species is relatively common, with specimens from almost all Bathonian beds. Fragmentary *Ptychophylloceras* sp. indet. specimens were collected from all the Bathonian beds. Therefore the species is considered to be widely represented throughout this stratigraphic stage.

Subordo **LYTOCERATINA** HYATT, 1889
Superfamilia **Lytoceratace ae** NEUMAYR, 1875
Familia **Lytoceratidae** NEUMAYR, 1875

Genus LYTOCERAS SUESS, 1865

Type species, by original designation (SUESS 1865—70, p. 78) *Am. fimbriatus* SOWERBY (1817, p. 145, pl. 164).

General remarks: Given a detailed treatment by PUGIN (1964), a general discussion of the Middle Jurassic lytoceratids here seems to be unnecessary. Despite attempts at separating several genera within this group (see BUCKMAN 1909—30, BESNOSSOW 1958a), PUGIN was inclined to maintain only three genera: *Lytoceras* s.s., *Ptycholytoceras* SPATH, 1927 and *Megalytoceras* BUCKMAN, 1905. However the discussion of some Middle Jurassic lytoceratids was overlooked by PUGIN, and these need some additional comments here.

A rather commonly recorded Bajocian-Bathonian form is *L. polyanchomenum* GEMMELLARO (1872, p. 14, pl. IV, figs. 2—3; lectotype: pl. IV, fig. 2, designated by WENDT 1964, p. 117). This species can be assigned to the *L. adelae* group characterised by the presence of constrictions and the appearance of non-undulating ribs. A less-known species is *L. dasyptychum* BÖCKH (1881, p. 34, pl. III, fig. 5), which shows, with its strong ribbing, some similarity to *L. linneanum* (D'ORBIGNY), but the constrictions and the bifurcating ribs suggest independent species. In his description, BÖCKH mentioned longitudinal striation on the shell.

A somewhat uncertain form is that described as *L. fasciculatum* by SIMIONESCU (1905, p. 14, pl. I, fig. 14). According to PUGIN (1964, p. 20) the figs. 13 and 14 on SIMIONESCU's pl. I. are transposed, like other figures in the same work. However, this seems not to be the case. In his description SIMIONESCU compared his new species to *L. villae* (MENEGHINI 1867, p. 104, pl. XX, fig. 3), and this resemblance is shown by fig. 14 on pl. I of SIMIONESCU. Therefore this drawing should be regarded as the type figure of *L. fasciculatum*. It is noteworthy that BESNOSSOW (1958a, p. 88, pl. XXV, fig. 1, text-fig. 33) described a new Upper Bajocian lytoceratid under the name *Dinolytoceras fascicostatum*, and this form, of similar coiling and ribbing, shows very close resemblance to SIMIONESCU's species. A revision of this latter form from the Eastern Carpathians might probably establish the identity of

these two species. The similarity was suggested even by BESNOSSOW (loc. cit. p. 86) who assigned *L. fasciculatum* also the genus "*Dinolytoceras*".

The species *Lytoceras hatzegi* HIMSHIASHVILI (1957, p. 38, pl. V, fig. 7) was based on a fragmentary specimen resembling the other fragment figured as *Lytoceras* n. sp. by POPOVICI-HATZEG (1905, p. 16, pl. II, fig. 10). Recently, PUGIN (1964, p. 28) and PATRULIUS (1969, p. 51) have established that this latter "*Lytoceras* n. sp." is in fact a *L. eudesianum* (D'ORBIGNY) specimen, so that HIMSHIASHVILI's poorly preserved Caucasian specimen may be a *L. eudesianum*, too.

The origin of the genus *Lytoceras* is still a matter of controversy. *Lytoceras* s.s. appears in the Sinemurian, but undoubtedly as a descendant of Hettangian forms. ARKELL (1957) and several other authors regarded the whole Lytoceratina suborder as a lineage separated in earliest Jurassic time from the common surviving Phylloceratina stock. Lately, WIEDMANN (1970) supposed the existence of three connecting lineages between the Triassic and Jurassic ammonites, and he suggested an Upper Triassic common ancestor for Lytoceratina, Phylloceratina and Ammonitina. He regarded *Trachyphyllites* from the Norian of Timor as the ancestral form of the Lytoceratina. However, according to TOZER (1971), the correct age of the *Trachyphyllites* is uncertain, and even a Lower Jurassic dating is possible. Most recently WIEDMANN (1973, p. 171, footnote) has given conclusive evidence of the Upper Triassic age of *Trachyphyllites*. However, until the Upper Triassic and especially the Lower Jurassic material is studied in detail, it seems justified to regard lytoceratids as representatives of an offshot of the lowermost Jurassic Phylloceratina.

Lytoceras s.s. occurs with gradually increasing diversity in the Lower Jurassic, than, after a maximum in the Toarcian, it shows an abrupt decline. This decline is restricted only to the number of species, because the population of the represented species remains high in the Middle Jurassic as well. The Middle Jurassic forms, as a rule are of long vertical range, with occurrences embracing 1 to 2 stages. The low diversity seems to endure within the Upper Jurassic, then a relative specific enrichment seems to occur. Last representatives of *Lytoceras* s.s. came from the Upper Cretaceous.

D i s t r i b u t i o n : *Lytoceras* s.s., which is the ammonite genus with the most extended vertical range in the Mesozoic, is a characteristic Tethyan form. Most common within the Mediterranean province of the Tethyan realm, but several species occur from the Pacific province too. As a subordinate faunal element, especially in the Liassic and the Cretaceous, it is known from the NW European region. In these periods some representatives reached the Boreal realm.

D i m o r p h i s m : No traces of dimorphism within the family Lytoceratidae have been demonstrated so far.

Lytoceras eudesianum eudesianum (D'ORBIGNY, 1846)

Pl. IX

1846. *Ammonites eudesianus* — D'ORBIGNY (1842–51), p. 386, pl. 128, figs. 1–3.
1858. *Ammonites lineatus fuscus (eudesianus)* — QUENSTEDT, p. 395, pl. 54, figs. 7–8.
1872. *Lytoceras Adeloides* KUD. sp. — GEMMELLARO, p. 181, pl. V, figs. 4–5.
non 1878. *Lytoceras Eudesianum* D'ORB. — GOTTSCHE, p. 8, pl. I, figs. 1. a-c.
?1881. *Lytoceras* cfr. *Eudesianum* D'ORB. sp. — BÖCKH, p. 31, pl. IV, figs. 2. a-c.
1886. *Ammonites fimbriatus gigas* — QUENSTEDT (1886–87), p. 550, pl. 68, figs. 1–2.
1886. *Ammonites lineatus fuscus* — QUENSTEDT (1886–87), p. 552, pl. 68, figs. 3–4.
1905. *Lytoceras* n. sp. ind. — POPOVICI-HATZEG, p. 16, pl. II, fig. 10.
1916. *Lytoceras adeloides* KUDERNATSCH — DOUVILLÉ, p. 13, pl. II, fig. 1.
1931. *Lytoceras adeloides* KUDERNATSCH — FLORIDIA, p. 100, pl. III, fig. 4.
1957. *Lytoceras hatzegi* n. sp. — HIMSHIASHVILI, p. 38, pl. V, fig. 7.
1964. *Lytoceras eudesianum* (A. D'ORBIGNY, 1846) — PUGIN, p. 28, pl. 2, fig. 1, text-fig. 5.
1964. *Lytoceras eudesianum* (ORBIGNY) — WENDT, p. 116, pl. 17, fig. 2.
1970. *Lytoceras eudesianum* (D'ORB.) s.l. — GALÁCZ, p. 123. (pars).
1972. *Lytoceras eudesianum* (D'ORBIGNY) — PAVIA, p. 95, pl. 15, fig. 1.
1972. *Lytoceras eudesianum eudesianum* (D'ORBIGNY) — KRYSTYN, p. 95, text-figs. 7–8.
non 1973. *Thysanolytoceras hatzegi* (KHIMSCHIASCHWILI) — PAITSCHADZE, pl. III, figs. 5–6, pl. XXXIII, fig. 11.

M a t e r i a l : 3 well-preserved and 3 fragmentary specimens.

D i m e n s i o n s :

J9253:	250;	95 (38);	93 (37);	81 (32.5)
J9257:	170;	68 (40);	66 (39);	64 (38)
J9256:	150;	61 (41);	59 (39.5);	50 (33)

D e s c r i p t i o n : The specimens are more or less complete, with the shell preserved. The figured specimen is a large phragmocone, with evolute coiling, rapidly growing whorls and a wide, deep umbilicus. The whorl-section is rounded and has the height and width nearly equal. The shell is simply ornamented with fine riblets and densely appearing collars, which are crincled over their full length. The number of these crincles is 5 or 6. On the inner and middle whorls the ornamentation is somewhat irregular and some collars appear as flares.

Entire suture-line on these shelly specimens cannot be seen, but the exposed parts are in good agreement with those on the figures in the literature (e.g. PUGIN 1964, text-fig. 5).

Remarks: As discussed recently by STURANI (1964b, pp. 12—13), *L. eudesianum* and *L. adeloides* are two forms distinguishable only on the subspecific level. The basis of distinction is the position and the number of the crinclos on the collars; i.e. the collars of *L. eudesianum* are entirely crincled, while the fewer crinclos of *L. adeloides* are restricted to the ventral part of the collars. On the basis of these same features PUGIN (1964) distinguished the two forms as separate species. However, these minor differences, recognizable exclusively in shelly specimens, seem to be of less than specific value, hence the more reasonable procedure of STURANI has been followed here.

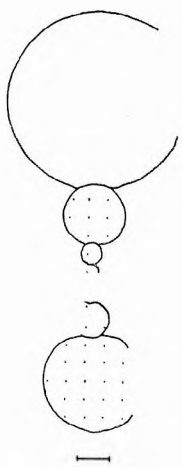
Distribution: *L. eudesianum eudesianum* is a characteristic Tethyan faunal element, though single specimens appear at NW European localities as well (e.g. QUENSTEDT 1858, 1886—87). Stratigraphically, it ranges from the Middle Bajocian to the Lower Bathonian, and as PUGIN (loc. cit. p. 33) indicated, it is particularly common in the Upper Bajocian. The Gyenespuszta specimens have come from Bed 16 (Subfurcatum and Garantiana Zones).

* * *

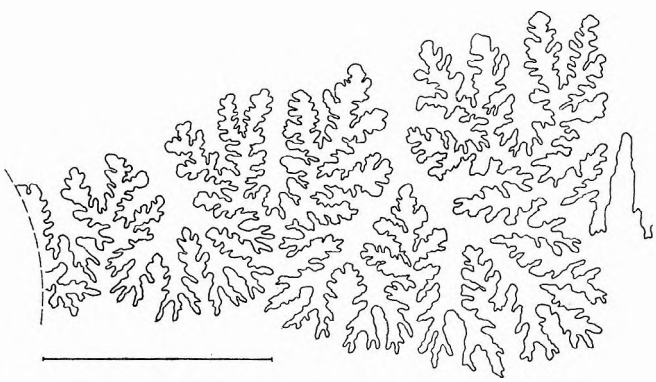
Bed 12 of the Gyenespuszta Profile VI (Parkinsoni Zone) yielded a small wholly septate *Lytoceras* with preserved shell, which is identical with *L. eudesianum eudesianum* and measures 59 (max. diam.), at 49 mm in diam.: 20 (41); 20 (41); 19 (39). The difference is a single, deep and wide constriction at 32 mm diameter. None of the *L. eudesianum* specimens figured previously in the literature shows any constriction. The constricted Middle Jurassic *Lytoceras* species [e.g. *L. adelae* (D'ORBIGNY), *L. polyanchomenum* (GEMMELLARO), *L. dasyptychum* BÖCKH] bear stronger ribs, and the constrictions are associated with rounded flares on the test. Other, finely ornamented and constricted *Lytoceras* species [*L. espinazitum* PUGIN (=*L. eudesianum* GOTTSCHE 1878) and *L. fasciculatum* SIMIONESCU] have periodically appearing constrictions in greater number. On the basis of these differences, this specimen is figured here (Pl. VIII, fig. 2) under the name *Lytoceras* sp. aff. *eudesianum eudesianum* (D'ORBIGNY).

* * *

The majority of the *Lytoceras* specimens in the Gyenespuszta collection (32 more or less entire specimens and several fragments) are internal moulds. Regarding their dimensions, coiling and suture-line (Text-figs. 37—38), these specimens agree well with both *L. e. eudesianum* and *L. e.*



Text-fig. 37. Whorl-section of *Lytoceras eudesianum* s. l. (J9255), VI/12, Zigzag Z.



Text-fig. 38. Suture-line of *Lytoceras eudesianum* s. l. (J9444), VI/4, Subcontractus Z.

adeloides. For lack of the shell, the distinctive feature of these forms, regarded as two subspecies above, cannot be recognized on the internal mould, thus these specimens have been determined, after STURANI (1964b), as *L. eudesianum* (D'ORBIGNY) s.l. A relatively well-preserved, wholly septate specimen [measurements: 143; 61 (42.5); 63 (44); 55 (38.5)] is figured here on Pl. X, fig. 1. Specimens given this name occur in almost all beds from the Subfurcatum Zone up to the Retrocostatum Zone.

Lytoceras adelae (d'Orbigny, 1844)

Pl. VIII, fig. 4, Pl. X, fig. 3

non 1848. *Ammonites Adelae* d'Orbigny 1844 — d'Orbigny (1842—51), p. 494, pl. 183, figs. 1—4.
1898. *Litoceras Adelae* d'Orbigny (sic!) — Strémooukhoff, p. 393, pl. II, figs. 1—4.
non 1911. *Lytoceras Adelae* d'Orbigny sp. — Flamand, p. 923, pl. VIII, figs. 3. a-b.
1956. *Lytoceras scrimea* Strém. em. (sic!) — Kakhadze—Zesashvili, p. 23, pl. IV, figs. 2—3. (only).
1958a. *Dinolytoceras* (?) cf. *adelae* Orbigny — Besnossow, p. 89, pl. XXV, fig. 3.
non 1963. *Dinolytoceras crimea* (Stremooukhoff) — Azarian, p. 194, pl. VIII, fig. 2, pl. IX, fig. 1, text-fig. 48.
1964. *Lytoceras adelae* (A. d'Orbigny, 1844) — Pugin, p. 13, pl. 1, fig. 2, text-fig. 3.
1970. *Lytoceras adelae* (d'Orb.) — Galácz, p. 123.
1971. *Lytoceras adelae* (d'Orbigny) — Sturani, p. 77, pl. 3, figs. 1—2.

Material: 4, relatively well-preserved specimens.
Dimensions: J9258: 91; 30 (37); 27 (29.5); 38 (42)
J9260: 65; 25 (38.5); 22 (34); 25 (38.5)
J9259: 57; 22 (38.5); 20 (35); 21 (37)

Description: The figured larger specimen (Pl. X, fig. 3) is a partially corroded internal mould of an adult specimen. The coiling is evolute, with a deep umbilicus. The whorl-section is compressed oval in shape, with convex umbilical wall, flanks and venter. The maximal thickness lies in the middle of the flanks. The inner and middle whorls are shown on the smaller, shelly specimen figured (Pl. VIII, fig. 4). This shows, that during the individual growth the coiling becomes gradually more evolute and the whorl-section tends to become rather compressed. The ribbing is simple. The inner and middle whorls bear dense, radial or slightly sinuous ribs with some intercalations from the middle of the whorl-sides. On the body-chamber the ornamentation consists of stronger, blunt ribs. The characteristic constrictions appear on the inner whorls, their number is 5 in each whorl. On the test, every constriction corresponds to a strong, blunt collar. The body-chamber begins at about 65 mm diameter and occupies the last half of the last whorl. The aperture is simple, with smooth peristomal margin and a deep pre-apertural constriction on the cast.

Because of the state of preservation, entire sutures not seen.

Remarks: *L. adelae* differs from the other Middle Jurassic *Lytoceras* species in having relatively small adult size, fine, dense ribs and constrictions. The nearest species is *L. polyanchomenum* Gemmellaro (1872). From this latter, *L. adelae* is distinguished by its coarsely ribbed body-chamber and fewer constrictions. However, the most important specific feature is shown by the inner and middle whorls, which are not constricted in *L. polyanchomenum*, but show usually 5 constrictions per whorl from 10—15 mm diameter in *L. adelae* (see Sturani 1971, p. 77, pl. 3, figs. 1—2). The relatively few figured description of this species was discussed in detail by Pugin (1964). From the recently published figures those of Azarian's "*Dinolytoceras*" *crimea* (1963, pl. VIII, fig. 2, pl. IX, fig. 1) represent specimens with fewer and poor constrictions and robust whorls, thus being assignable rather to *Lytoceras neumayri* Pugin (1964, p. 34).

Distribution: The type of this characteristically Tethyan species came from the Upper Bathonian-Lower Callovian beds of the Crimea. According to Pugin (loc. cit., p. 19), its stratigraphic range extends from the Upper Bajocian up to the Callovian. The Gyenespuszta specimens have been recovered from Beds 14, 13 and 11, i.e. the Parkinsoni and Zigzag Zones of Profile VI.

? Familia **Nannolytoceratidae** Spath, 1927

Genus NANNOLYTOCERAS Buckman, 1905

Type species, by original designation (Buckman 1905, p. 151), *N. pygmaeum* (d'Orbigny 1842—51, p. 391, pl. 129, figs. 12—13).

General remarks: Spath (1927—33, p. 66) included two genera *Nannolytoceras* Buckman and *Polystomiceras* Spath (1924, p. 5) in his Nannolytoceratidae family. However, the second taxon is a synonym of *Nannolytoceras* of which *Ammonites tripartitus* Raspail is the type. Arkell (1957, pp. L198—199) maintained the Nannolytoceratidae family and included, with a question mark though, the Lower Jurassic genus *Audaxlytoceras* Fucini (1923, p. 106) in it. Besnossow (1958a, pp. 100—101) put the *Nannolytoceras* and his *Eurystomiceras* genus (Besnossow 1956, p. 110) into the family. However, the second taxon differs only with some minute characters from *Nannolytoceras*, therefore its state as an independent genus can be doubted (see below).

Recently, Fantini-Sestini (1973) has demonstrated that the genus *Audaxlytoceras* belongs to the Derolytoceratidae family, thus having no connection with the nannolytoceratids. Consequently, the Nannolytoceratidae family comprises just a single genus.

According to BESNOSSOW (1958a, pp. 100—101), the family Nannolytoceratidae can be derived from the Megalytoceratinae subfamily, with "*Eurystomiceras*" as a transitional form. This connection should be regarded as highly probable, especially on the basis of the Lower Bathonian *Megalytoceras* species described and figured by BESNOSSOW. Judging by the close similarities, *Megalytoceras* and *Nannolytoceras* seem to be so closely allied forms, that this fact should be reflected in the taxonomy as well. As a proper solution, the inclusion of *Nannolytoceras* in the subfamily Megalytoceratinae seems to be justified.

BESNOSSOW (1958) and PUGIN (1964) gave detailed discussions of the majority of the forms assigned to *Nannolytoceras*. Some additional species of this genus are as follows.

Nannolytoceras nicolisi (PARONA 1894, p. 16, pl. I, figs. 10—13; lectotype: pl. I, fig. 10, see STURANI 1971, p. 78)
Nannolytoceras pluriannulatum (PARONA 1894, p. 16, pl. I, fig. 14)
Nannolytoceras paucisulcatum RAKUS, 1965 (p. 169, pl. IX, fig. 2, pl. X, fig. 2, text-figs. 2. a-c)
Nannolytoceras sturanii PATRULIUS, 1969 [p. 54, for *Nannolytoceras* (?) sp. ind. in STURANI 1966, p. 23, pl. 3, fig. 8]

D i s t r i b u t i o n : The first representatives of the genus *Nannolytoceras* appear in the Bajocian Humphriesianum Zone. The genus is most common in the Upper Bajocian and Lower Bathonian. The first, certainly Middle Bathonian forms are recorded now from this Gyenespuszta Progracilis Zone fauna. The youngest representative of the genus is known to be a single species from a single locality [*N. ilanense* (STRÉMOOUKHOFF), Middle Callovian, Crimea]. The genus is equally known from both Tethyan and NW European localities, but its occurrences of greatest diversity and density are confined to the Mediterranean province.

D i m o r p h i s m : Similarly to the case of other lytoceratids, no dimorphic feature of the *Nannolytoceras* has been recorded so far.

Nannolytoceras polyhelictum (BÖCKH, 1881)

Pl. X, fig. 2, Pl. XI, fig. 1, Text-figs. 39—41

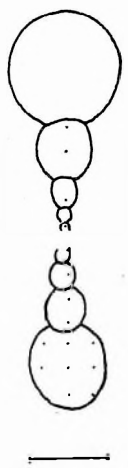
1881. *Lytoceras polyhelictum* n. sp. — BÖCKH, p. 35, pl. I, figs. 2—3.
1892. *Lytoceras polyhelictum* BÖCKH — NEUMAYR—UHLIG, p. 39, pl. III, fig. 2.
1923. *Lytoceras tripartitum* RASP. sp. — TRAUTH, p. 226, pl. II, fig. 6.
1937. *Lytoceras polyhelictum* BÖCKH — HORWITZ, p. 243, pl. IX, fig. 3.
1956. *Lytoceras crimea* STRÉM. em. — KAKHADZE—ZESASHVILI, p. 23, pl. III, fig. 2. (only).
1958a. *Eurystomiceras polyhelictum* (BÖCKH) — BESNOSSOW, p. 101, pl. XXXIII, figs. 2, 3, text-figs. 38—39.
1958b. *Eurystomiceras polyhelictum* (UHLIG) — BESNOSSOW, p. 116, text-fig. 6.
1964a. *Nannolytoceras nicolisi* (PAR.) — STURANI, p. 31. pl. IV, fig. 4.
1964. *Eurystomiceras polyhelictum* (J. BÖCKH, 1881) — PUGIN, p. 42, pl. 3, fig. 7, text-fig. 8.
?1964. *Eurystomiceras* cf. *polyhelictum* (J. BÖCKH) — PUGIN, pl. 2. figs. 4—5.
1969. *Eurystomiceras polyhelictum* (J. BÖCKH, 1881) — ROMANOV, p. 83, pl. I, fig. 10.
1970. *Eurystomiceras polyhelictum* (BÖCKH) — GALÁCZ, p. 123.
1971. *Nannolytoceras (Eurystomiceras) polyhelictum* (BÖCKH) — STURANI, p. 79, pl. 3, fig. 4.
1972. *Nannolytoceras (Eurystomiceras) polyhelictum* (BOECKH) — PAVIA, p. 96, pl. 14, figs. 6, 8, 9, text-fig. 5
1975. *Nannolytoceras* aff. *N. polyhelictum* (BÖCKH) — WESTERMANN, p. 36, pl. 1, fig. 7.

M a t e r i a l : 67 well-preserved, measurable specimens and nearly 200 fragmentary ones.

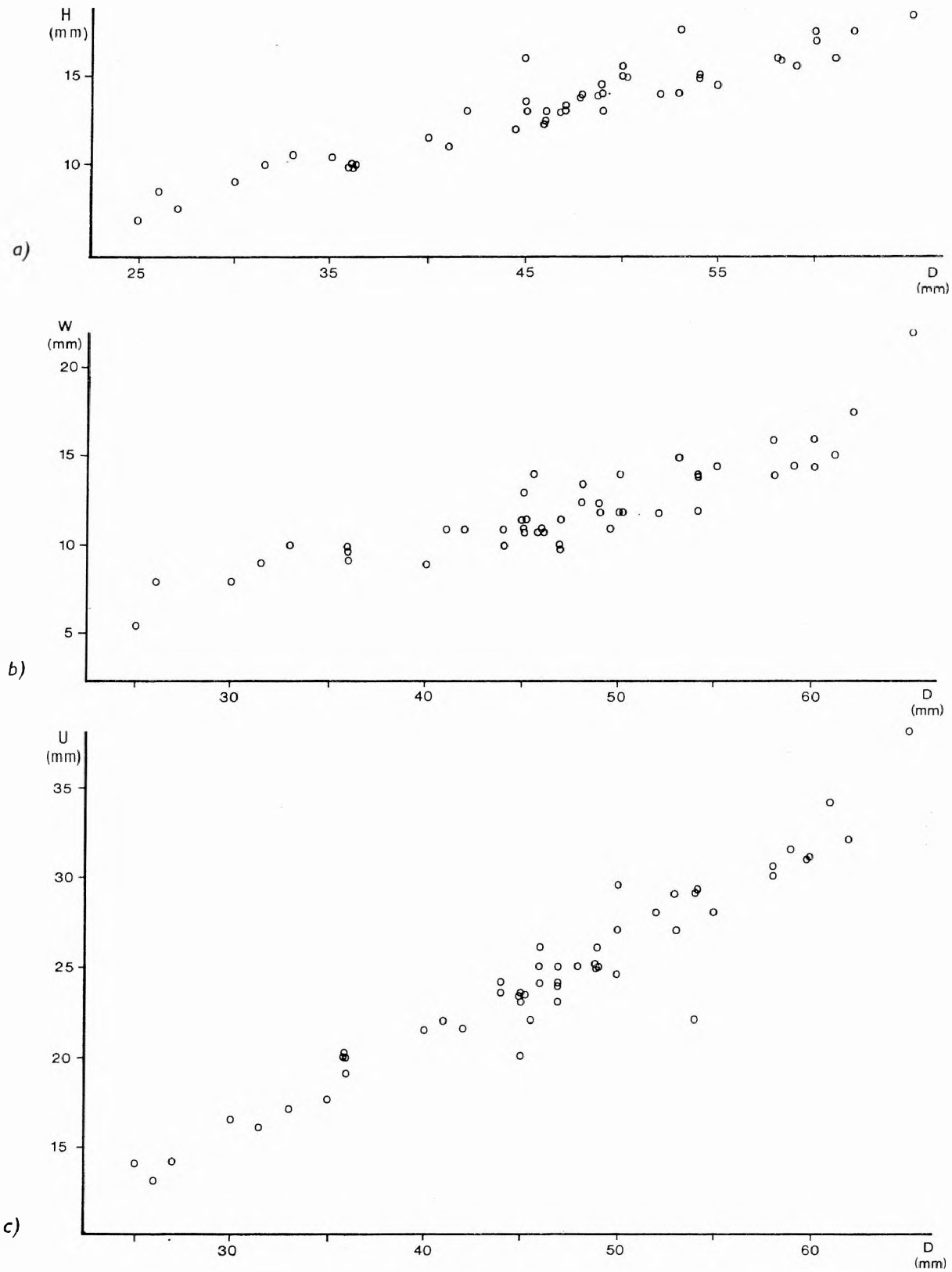
D i m e n s i o n s :

J9266:	60;	17.5 (24);	14.5 (24);	31 (52)
J9268:	53;	17.5 (29.5);	15 (28);	27 (51)
J9267:	44;	12 (27);	11 (25);	24 (54)
J9265:	31.5;	10 (32);	9 (28.5);	?16 (?51)
J9264:	26;	8.5 (33);	8 (31);	13 (50)

D e s c r i p t i o n : Medium-sized, widely umbilicated form. The whorl-section is high-oval or slightly quadrangular, with rounded umbilical and ventrolateral edges and convex whorl-sides and venter (Text-fig. 39). The whorls are smooth, the ornamental elements are represented only by constrictions. The constrictions number 5 to 6 on the last and 4 to 5 on the inner and penultimate whorls. They are prorsiradiate and forward-arched on the whorl-sides and straight on the venter. Their anterior margin is steeper and here the margin is heavily swollen. In some specimens the constrictions appear in close pairs, which are separated by a swollen ridge, like on the form figured by STURANI (1966, pl. 3, fig. 8). The body-chamber generally begins at 40—45 mm and its length is equal to about a whole whorl. Near to the aperture the last two constrictions occur closer to each other, as is well shown on of TRAUTH's figure (1923, pl. II, fig. 6). In the Gyenespuszta material there is no complete specimen with preserved aperture, thus the preapertural ventral constriction, which is said to be characteristic, is unrecognizable.



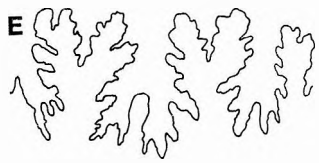
Text-fig. 39. Whorl-section of *Nannolytoceras polyhelictum* (J9443), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 40. Whorl-height (a), whorl-width (b) and umbilical width (c) plotted against diameter for specimens of *Nannolytoceras polyhelictum* from Gyenespuszta

The suture-line (Text-fig. 41) is of simple *Nannolytoceras* type with diphyllic saddles and two-pronged lobes.

Remarks: Besnossow (1958a) based a new genus *Eurystomiceras* on the species of Böckh. According to the original diagnosis (Besnossow 1958a, p. 101), the generic feature is the longitudinal ventral furrow running forwards from the anterior margin of the last constriction. However, as suggested by Sturani (1971, p. 80), this is hardly a feature of generic value, therefore it seems more reasonable to place this species into the genus *Nannolytoceras*. All of the generic characters of this species being of *Nannolytoceras* type, the *Eurystomiceras* should be given up even as a subgeneric name.



Text-fig. 41. Suture-line of *Nannolytoceras polyhelictum* (J9263), VI/15, Parkinsoni Z.

The only available figure of the type of this species was the drawing in the monograph of Böckh (1881, pl. I, fig. 2), so that Besnossow (1958b, p. 116) designated a neotype. This was the original of the fine figure of Neumayr and Uhlig (1892, pl. III, fig. 2). At the same time, Besnossow figured a specimen from the area of Neumayr and Uhlig's original localities in Daghestan, from the Stephanoceras humphriesianum Zone, and even he altered the name of the species to *E. polyhelictum* (Uhlig). However, this procedure is contrary to the Rules of Zoological Nomenclature (see Article 4). Consequently the type (as holotype) of this species is the original specimen shown in fig. 2 of plate I of Böckh (1881).

Distribution: The holotype came from the Strenoceras subfurcatum Zone of the Mecsek Mountains (S Hungary). In this type-area it occurs also in the Humphriesianum Zone. According to the literature this species is widely recorded from Tethyan localities, from the Middle and Upper Bajocian. At Gyenespuszta it occurs from the Subfurcatum up to the Parkinsoni Zone of the profiles, being most common in Bed 16 of Profile VI.

Nannolytoceras tripartitum (Raspail, 1831)

Pl. XI, figs. 2—3, Text-fig. 42

	1848.	*Ammonites tripartitus* Rasp. — d'Orbigny (1842—51), p. 196, pl. 197, figs. 1—4.
	1849.	*Ammonites polystoma* — Quenstedt, p. 270, pl. 20, fig. 8.
non	1905.	*Lytoceras tripartitum* Rasp. — Simionescu, p. 13, pl. II, fig. 4.
non	1911.	*Lytoceras tripartitum* Raspail — Flamand, p. 917, pl. VII, fig. 2.
non	1920.	*Protetragonites* cf. *tripartitus* Raspail sp. — Spath, p. 355, pl. V, figs. 6. a-c.
	1921.	*Lytoceras tripartitum* Raspail — Riche—Roman, p. 149, pl. VII, fig. 1.
non	1923.	*Lytoceras tripartitum* Rasp. sp. — Trauth, p. 226, pl. II, fig. 6.
	1928.	*Lytoceras tripartitum* Raspail — Sayn—Roman, p. 52, pl. V, fig. 8.
non	1958a.	*Nannolytoceras* aff. *tripartitum* (Raspail) Orb. — Besnossow, p. 104, pl. 34, fig. 1., text-fig. 40.
non	1960.	*Nannolytoceras* cf. *tripartitum* (Raspail) — Chrıst, p. 64, pl. 2, fig. 9.
	1964.	*Nannolytoceras tripartitum* (F. V. Raspail, 1831) — Pugin, p. 48, pl. 3, figs. 1—6, text-figs. 9—10.
	1966.	*Nannolytoceras tripartitum* (Raspail) — Sturani, p. 23, pl. 3, fig. 9.
non	1969.	*Nannolytoceras tripartitum* Raspail — Mihajlovič, p. 60, pl. II, fig. 3. (only).
	1970.	*Nannolytoceras tripartitum* (Rasp.) — Galácz, p. 123.
	?1971.	*Nannolytoceras tripartitum* d'Orb. — Maxim et al. p. 414, pl. X, figs. 11—12.
	1971.	*Nannolytoceras* cf. *tripartitum* (Rasp.) — Sturani, pl. III, fig. 5.

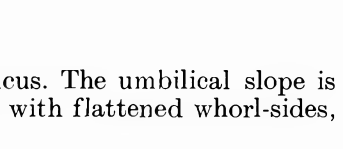
Material: 10 relatively well-preserved and 5 fragmentary specimens.

Dimensions:

J9271:	70;	19 (22);	15 (21.5);	36 (51.5)
J9273:	65;	17 (26);	13 (20);	29 (45)
J9270:	55;	13.5 (24.5);	—	29 (53)
J9272:	50;	14 (28);	10 (20);	29 (58)

Description: Small-sized form with wide and shallow umbilicus. The umbilical slope is low, the umbilical margin is rounded. The whorl-section is quadrangular with flattened whorl-sides, rounded ventrolateral edge and narrow, arched venter. The whorls are smooth on the internal mould, the test shows fine, curved growth-lines. The sigmoid constrictions (4 to 5 per whorl) are strongly prorsiradiate on the flanks and posteriorly arched on the venter. The body-chamber begins at 50—55 mm diameter, but its exact length cannot be measured owing to the absence of specimens with preserved aperture in the material.

The suture-line (Text-fig. 42) is simple, *Nannolytoceras* type, with wide saddles and lobes.



Text-fig. 42. Suture-line of *Nannolytoceras tripartitum* (J9271), VI/12, Zigzag Z.

Remarks: Morphology and synonymy of this species were exhaustively discussed by Pugin (1964). On the basis of the rather poor Gyenespuszta material nothing can be added to that description.

This species is easily distinguished from the species *N. polyhelictum* (Böckh) by its flattened whorl-sides, fewer and "S"-shaped constrictions and its suture-line with wider saddles and lobes.

Distribution: *N. tripartitum* is widely recorded and described from both the NW European and Tethyan areas, from the Upper Bajocian and Lower Bathonian horizons. At Gyenespuszta the specimens came from the Parkinsoni, Zigzag and Progracilis Zones (Beds 13—8) of Profile VI and from the Parkinsoni Zone of Profile III.

Subordo **AMMONITINA** Hyatt, 1889
Superfamilia **Haploceratataceae** Zittel, 1884
Familia **Strigoceratidae** Buckman, 1924

Genus STRIGOCERAS Quenstedt, 1886

Type species: *Strigoceras truellei* (d'Orbigny, 1845), lectotype: d'Orbigny 1842—51, pl. 177, figs. 1—3.

General remarks: The first representatives (*S. compressum* Etheridge) appear in the lower Sowerbyi Zone of the Bajocian, where these are associated with *Trilobiticeras*, a characteristic lowermost Bajocian form (Parsons 1974, p. 169). It is noteworthy, that Sturani (1971, pp. 119—120) suggested that several Bajocian species [*S. strigifer* (Buckman) and *S. languidum* (Buckman) from the Sauzei and *S. pseudostrigifer* (Maubeuge) from the Humphriesianum Zone] are conspecific with *S. compressum*. The Bajocian *Strigoceras* can be derived from the Aalenian *Praestrigites*, which is, in turn, a descendant of *Hammatoceras (Csernyeiceras)* (Géczy 1967, pp. 221—222). A similar view is held by Westermann (1969, p. 69), who regards the *Eudmetoceras klimakomphalum* group as the ancestor of *Praestrigites*.

Distribution: After the lowermost Bajocian appearance of the *Strigoceras* species of characteristically wide vertical range, these occur up to the Middle Bathonian (*S. dorsocavatum* Quenstedt: basal Subcontractus Zone, see Mangold et al. 1967, p. 107). The species appear both in the Mediterranean and the NW European areas, but the family itself seems to be of Tethyan origin, because its origination can be demonstrated at localities within this realm.

Dimorphism: The macroconchiate *Strigoceras* were paired by Sturani (1971) with the genus *Cadomoceras*. According to his arguments, this match can be supported by morphological as well as stratigraphical similarities. Nevertheless, the stratigraphic range of *Cadomoceras* is confined only to the Humphriesianum, Subfurcatum and Parkinsoni Zones, and no *Cadomoceras* or closely allied forms have been recorded from the Lower Bajocian and the Lower and Middle Bathonian. On morphologic ground a *Strigoceras—Cadomoceras* pairing seems to be as well-established, but not until a stratigraphic coincidence is proved, can the subgeneric subordination of *Cadomoceras* to *Strigoceras* be justified.

Strigoceras truellei (d'Orbigny, 1845)

Pl. XI, fig. 4

1845. *Ammonites Truellei* — d'Orbigny (1842—51), p. 361, pl. 117, figs. 1—3, pl. 129, figs. 1—2.
1858. *Ammonites Truellei* — Quenstedt, p. 395, pl. 53, fig. 6.
non 1865. *Ammonites Truellei* Orb. — Schloenbach, p. 27, pl. 3, fig. 2.
1878. *Oppelia Truellei* d'Orbigny sp. — Bayle, pl. 59, figs. 1, 3, 4 (only).
?1884. *Amaltheus* cf. *Truellei* d'Orb. sp. — Douvillé, p. 37, text-fig. 16.
1886. *Ammonites Truellei* (cum var.) — Quenstedt (1886—87), p. 565, pl. 69, figs. 7—13.
1896. *Hecticoceras* (?) *pingue* Par. — Parona, p. 13, pl. I, fig. 5.
1896. *Hecticoceras (Lunuloceras) canovincola* de Greg. — Parona, p. 13, pl. I, fig. 6.
1907. *Strigoceras Truellei* d'Orbigny — Lissajous (1907—10), p. 131, pl. 3, fig. 5 (only).
?1911. *Oppelia (Strigoceras) Truellei* d'Orbigny sp. — Flamand, p. 884, pl. IV, fig. 14.
1912. *Strigoceras Truellei*, Sowerby — Roman—Gennevaux, p. 88, pl. III, fig. 3.
1923. *Strigoceras Truellei* d'Orb. sp. — Fallot—Blanchet, p. 139, text-figs. 6—7 (only).
1924. *Strigoceras truellei* d'Orbigny sp. 1846. — Buckman (1909—1930), pl. 472.
1925. *Strigoceras gracile* Quenstedt sp. — Buckman (1909—30), pl. 585.
1928. *Strigoceras Truellei* d'Orb. — Scheurlen, p. 7, pl. I, figs. 5—11.
1961. *Strigoceras truellei* (d'Orbigny) — Dollfus, p. 7, pl. 2, fig. 4.
1964a. *Strigoceras truellei* (d'Orb.) juv. — Sturani, p. 37, pl. V, fig. 6.
1964b. *Strigoceras truellei* (d'Orbigny) — Sturani, p. 14, pl. II, fig. 1.
1970. *Strigoceras truellei* (d'Orb.) — Galácz, p. 118.
1971. *Strigoceras truellei* (d'Orb.) — Sturani, p. 120, pl. 4, figs. 6—9.
1972. *Strigoceras truellei* (d'Orbigny) — Pavia, pl. 16, fig. 10.
1972. *Strigoceras truellei* (d'Orbigny) — Krystyn, p. 246, text-fig. 15.

Material: Two relatively well-preserved and 7 fragmentary specimens.
Dimensions: J9274: 105; 60 (52); ?25 (?24); 7 (6.7)
J9275: 98; 56 (57); ?19 (?19.5); 6.5 (6.6)

Description: The figured specimen is a medium-sized, partly corroded, wholly septate internal mould. The umbilicus is narrow and deep, with high and perpendicular umbilical wall, and rounded umbilical margin. The whorl-section is high sphenoidal, with flattened whorl-sides and an acute periphery. On the specimen the fragmentary parts of the high ventral keel are visible. The whorl-sides bear three wide and low longitudinal ridges, one at the umbilical margin, one at the lower third and one at the middle of the flanks. In the manganese-coated part of the specimen the fine spiral flutiny (strigation) can be traced. At the inner third of the whorl-sides low, coarse, irregularly biplicate ribs arise. The secondaries, occurring on the outer third of the flanks, are somewhat stronger.

The specimens are wholly septate internal moulds, nevertheless, because of the poor state of preservation, no complete suture-line can be deciphered. The visible portions, however, show the complex sutures characteristic of the genus.

Remarks: The synonymy of this easily distinguished *Strigoceras* species was discussed by Sturani (1964b, 1971) in detail. In spite of their incomplete state, the Gyenespuszta specimens can be well compared to the lectotype (d'Orbigny 1842—51, pl. 177, figs. 1—3).

Distribution: The stratigraphic range of this species, common in both the Mediterranean and NW European region, falls within wide limits. It occurs in all three zones of the Upper Bajocian, being most common in the Parkinsoni Zone. In England, it is characteristic in the lower part of this latter zone. At Gyenespuszta the majority of the specimens has come from Bed 16 (Subfurcatum and Garantiana Zones), and a single specimen was collected from Bed 15 (lower Parkinsoni Zone) of Profile VI.

Familia **Haploceratidae** Zittel, 1884

Genus LISSOCERAS Bayle, 1879

Type species, by original designation (Bayle 1879, p. 34), is *L. psilodiscus* (Schloenbach 1865, p. 31, pl. 28, figs. 6a-c).

General remarks: With designation of the genus, Bayle (loc. cit.) had apparently intended to substitute *Haploceras* Zittel (1870), because he regarded this latter name as the synonym of *Aploceras* d'Orbigny (1850, p. 112). Spath (1923—43, p. 14, footnote) considered this substitution to be unjustified, and retaining the name *Haploceras* for the Tithonian group of *Am. elimatum* (Oppel, in Zittel 1868b), he introduced the new generic name *Lissoceratoides* for the forms of the lower part of the Upper Jurassic.

Subsequent authors followed partly Bayle's procedure, and partly Spath's, treating the Middle Jurassic and Upper Jurassic forms under the name *Lissoceras* or *Lissoceratoides*, respectively. Roman (1938, p. 173) and later Arkell (1951—59, p. 48) suggested that the two genera might be united, because their morphological features were hardly distinguishable. Arkell (1957, p. L273) separated these two poorly ornamented, thus hardly classifiable groups on the subgeneric level, referring to the relatively wide stratigraphic gap between the ranges of the forms concerned. However, several authors (see in Kunz 1967, p. 277 and Schindewolf 1963, p. 356) argued against this separation.

Morphologically, the unification of the two groups is unquestionable, the stratigraphical gap between them tends to be narrower in the light of new data. Even in the monograph of Lóczy (1915, p. 59) there is a "genealogical line" (Entwicklungsreihe), thought to be continuous from the Bajocian *L. oolithicum* up to the Kimmeridgian *L. erato*. With some additions the lineage of this slowly evolving and morphologically constant group can be corrected.

The earliest representative is the *L. semicostulatum* Buckman from the Sowerbyi Zone of England. Similar forms are known from the North American Middle Bajocian (Imlay 1962, 1964). *L. oolithicum* (d'Orbigny) appears in the Middle Bajocian Humphriesianum Zone, and ranges up to the topmost Bajocian. *L. meletense* (Parona) and *L. monachum* (Gemmellaro) occur in the Subfurcatum and Parkinsoni Zone, respectively. *L. psilodiscus* (Schloenbach) and its subspecies *L. p. inflatum* Wetzel appear in the upper Parkinsoni Zone. The nominate subspecies is a characteristic element in the Zigzag Zone faunas. The genus becomes more differentiated within the Zigzag Zone, where 4 to 5 species are recorded (e.g. *L. haugi* Sturani, *L. ventriplanum* Wendt, etc.). *L. ferrifex* (Zittel) is the most common Middle to Upper Bathonian species of this genus.

According to Arkell (1957), the stratigraphic gap between the *Lissoceras* and *Lissoceratoides* comprises the Upper Bathonian, Lower and Middle Callovian. However, from this interval several *Lissoceras* are recorded, especially from Mediterranean localities. Sturani (1966) described Upper

Bathonian *Lissoceras* from Digne (SE France), and the Gyenespuszta fauna described here contains *L. ferrifex* specimens of similarly Upper Bathonian age. *L. voultense* (OPPEL) is a common element in Lower and Middle Callovian faunas (e.g. LÓCZY 1915, p. 57; RICHE—ROMAN 1921, p. 154; ROMAN 1924, pp. 47, 88). *L. erato* is common from Upper Callovian up to the Upper Oxfordian.

On the basis of the above occurrences, the unification of the two groups seems to be justified even stratigraphically and by virtue of the law of priority the name of the group is *Lissoceras*.

SPATH (1923—43, p. 33) derived *Lissoceras*, like other haploceratids, from the Phylloceratidae. However, this hypothesis is inconsistent with the sharp differences of the suture-lines. According to the other conception (ARKELL 1957, p. L271), the whole Haploceratacеae superfamily would have originated from the Hammatoceratidae. Some special forms (e.g. *Vastites* ARKELL; see also discussion of *L. magnum*, below) make this latter origination more possible, especially in the case of a part of the group.

Distribution: *Lissoceras* ranges from the Bajocian Sowerbyi Zone up to the Upper Jurassic. Its Middle Jurassic representatives are mainly of Mediterranean distribution, i.e. are yielded by Tethyan faunas in greater abundance and diversity. The wide Tethyan distribution is marked by such localities as the northern Chilean Upper Bajocian (WESTERMANN 1967a, p. 425), the Alaskan Middle Bajocian (see above), or Indonesia (ARKELL 1956, p. 439), Iran (ASSERETO et al. 1968, table 7, ALLENBACH 1966, p. 34), Kutch (SPATH 1933, p. 673, pl. 127, fig. 9), Arabia (DOUVILLÉ 1916, p. 17), Caucasus (HIMSHIASHVILI 1957, p. 50) and the Kuban Valley (ZATWORNITZKY 1914, p. 543) in the eastern Tethyan realm.

Dimorphism: Previous authors suggested *Cadomoceras* as microconch counterpart of macroconchiate *Lissoceras*. Recently, STURANI (1971) has suggested, that the genus *Cadomoceras*, on the basis of its morphological features can be matched with *Strigoceras*, and he removed *Cadomoceras* from the Haploceratidae and put it into the Strigoceratidae family. In addition, he did find the microconch pair of the Middle Bajocian *Lissoceras*, and instituted a new microconch subgenus, *Microlissoceras*, thereupon. However, this procedure raises nomenclatural problems (see STURANI loc. cit. p. 93), owing to a microconch pair suggested for the Upper Jurassic Haploceratidae (*Glochiceras*, see MAKOWSKI 1963, p. 71).

On morphological ground, *Glochiceras* would be the pair of both *Haploceras* and Upper Jurassic *Lissoceras* (*Lissoceratoides* auctt.). According to STURANI, the type species of *Glochiceras* [*G. nimbatum* (OPPEL)] is younger than any known *Lissoceras*, so that only the *Glochiceras* (m)—*Haploceras* (M) match is justifiable. In the light of the above continuous connection between the Middle and Upper Jurassic *Lissoceras* groups, this statement may be doubted. On the other hand, ZIEGLER (1958) demonstrated in his monograph, that several *Glochiceras* species (incl. *G. nimbatum*) had appeared as early as the Oxfordian, thus a *Lissoceras—Glochiceras* match could not be precluded even from the stratigraphic viewpoint. The relatively wide stratigraphic gap between the Middle Oxfordian and Middle Bajocian *Lissoceras* microconchs requires some commentary. The following records should be quoted.

Recently, PARSONS (1976, p. 126) recorded a *Microlissoceras* from the basal Upper Bajocian Subfurcatum Zone. In 1977 PAVIA (personal communication) collected *Microlissoceras* specimens from the Upper Bajocian Parkinsoni Zone of Bayeux. Particularly interesting is *Lissoceras minimum* described by DJANÉLIDZE (1933, p. 11, pl. II, fig. 5) from the Lower Callovian of the Caucasus. This is a lappetted form of 11 mm diameter, which closely resembles the holotype of *L. (Microlissoceras) pusillum* STURANI (1971, pl. 6, fig. 7). Similar Callovian forms are those described by OPPEL (1857) as *Am. auritulus* (see OPPEL 1862, p. 155, pl. 49, figs. 2—3 only). These small, lappetted ammonites are, unquestionably microconchiate haploceratids from the Upper Callovian of Württemberg. Another indisputable *Lissoceras* microconch was described by UHLIG (1881, p. 391, pl. VII, fig. 8) under the name "*Oppelia (Oekotraustes) auritula* OPP." from the Lower Callovian of Babierzowka (Northern Carpathians). This latter form was associated with macroconch *Lissoceras* ("*Haploceras ferrifex* ZITT." in UHLIG, loc. cit.). If records similar to those listed here continue narrowing the apparent Bathonian and Upper Callovian—Lower Oxfordian stratigraphic gap, the need for substituting *Glochiceras* for the subgeneric name *Microlissoceras* will become evident. Further studies are needed for accurate pairing of the younger *Glochiceras* subgenera and species with the younger *Lissoceras* and *Haploceras* species.

Lissoceras haugi STURANI, 1966

Pl. XI, fig. 7

1935. *Lissoceras* sp. — BIRCHER, p. 137, pl. IX, fig. 8.
1966. *Lissoceras haugi* n. sp. — STURANI, p. 24, pl. 3, figs. 16a-b.
1970. *Lissoceras* sp.? — GALÁCZ, p. 117.

Material: A single incomplete internal mould.
Dimensions: J9276: 63; 28 (44.5); 27 (43); 20 (32)

Description : The medium-sized specimen shows only the last part of the phragmocone and about the half of a whorl of the body-chamber. The umbilicus is relatively wide, the umbilical wall is high and convex, the umbilical edge is rounded. The flanks are markedly convex, the venter is widely-arched. The whorl-section is compressed-oval, with greatest width near the inner third of the whorl height. The internal mould is smooth, the body-chamber begins at about 47 mm diameter, the aperture is not preserved. The suture-line cannot be studied in detail, but some of its preserved parts show characteristic haploceratid features.

Remarks : The distinctive feature of *L. haugi* is its inflated whorl. The single comparable form is *L. meletense* (PARONA), with its similarly rounded, but depressed-oval whorl-section (see STURANI 1971, p. 93). However, it is possible that *L. meletense* and *L. haugi* are synonyms, but the unite of these two forms needs the knowledge of the fully-grown specimens of the former and the inner whorls of the latter species. (The small specimen figured by STURANI, 1966, pl. 3, figs. 12a-b from the Upper Bathonian is rather a nucleus of *L. ferrifex.*) This poorly preserved single specimen of Gyenespuszta does not contribute to solving the problem.

Distribution : STURANI described this species from the Lower Bathonian of Digne (SE France). The Gyenespuszta specimen has come from the Subfurcatum Zone of Profile VI (Bed 17).

Lissoceras oolithicum (D'ORBIGNY, 1845)

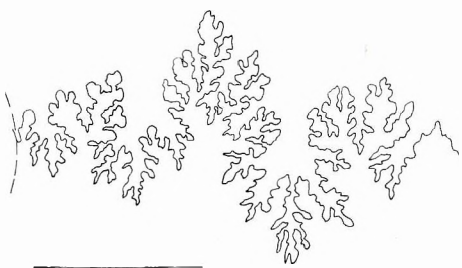
Pl. XI, figs. 5–6, Text-figs. 43, 45

1845. *Ammonites oolithicus* — D'ORBIGNY (1842–51), p. 383, pl. 126, figs. 1–4.
1858. *Ammonites oolithicus* — QUENSTEDT, p. 396, pl. 55, fig. 20.
1886. *Ammonites oolithicus* — QUENSTEDT (1886–87), p. 563, pl. 69, fig. 4 (only).
1909. *Lissoceras oolithicum* D'ORBIGNY — LISSAJOUS (1907–1910), p. 180, pl. 5, fig. 21.
1916. *Lissoceras oolithicum* D'ORBIGNY — DOUVILLÉ, p. 17, pl. III, fig. 9.
1922. *Lissoceras oolithicum* D'ORB. — BATALLER, p. 79, pl. VII, fig. 5.
1927. *Lissoceras oolithicum* D'ORBIGNY — ROMAN–PÉTOURAUD, p. 48, pl. V, fig. 13 (only).
non 1927. *Lissoceras oolithicum* D'ORB. — DORN, p. 245, pl. 7, fig. 3.
1970. *Lissoceras oolithicum* (D'ORB.) — GALÁCZ, pp. 118–119.
1971. *Lissoceras oolithicum* (D'ORBIGNY) — STURANI, p. 91, pl. 6, fig. 2.
1971. *Lissoceras oolithicum* (D'ORBIGNY) — MORTON, p. 270, pl. 40, figs. 1–2.

Material : 8 poorly preserved, fragmentary internal moulds.
Dimensions: J9280: 76; 34 (45); 20 (26); 18 (24)
J9279: 74; 32 (43); 18 (24); 17 (23)
J9277: 66; 31 (47); ?20 (?30.5); 16 (24)

Description : Medium-sized form with a moderately wide umbilicus. The umbilical edge is rounded, the flanks are flattened and convergent, the venter is narrowly rounded. The whorl-section (Text-fig. 43) is compressed-oval. The internal mould is smooth, but the test, which is partly preserved in a fragmentary specimen, shows fine sigmoid growth-lines. Aperture not preserved.

Text-fig. 43. Whorl-section of *Lissoceras oolithicum* (J9277), VI/13, Parkinsoni Z.



Text-fig. 44. Suture-line of *Lissoceras oolithicum* (J9277), VI/13, Parkinsoni Z.

The suture-line (Text-fig. 44) is relatively simple. E is short, L wide, twice as long as E and symmetrically trifid. The other visible lobes are asymmetrically trifid. ES wide and shorter than LS. Other saddles are low and less-divided.

Remarks: *L. oolithicum* is distinguished from the other *Lissoceras* species by the whorl-section, i.e. it differs with the compressed shape and the narrow venter from *L. ferrifex* (ZITTEL) and with the larger size and wider umbilicus from *L. psilodiscus* (SCHLOENBACH). In the previous literature the form of QUENSTEDT (1886—87, pl. 69, fig. 5) shows a wide, triangular whorl-section, and this resembles rather the species *L. monachum* (GEMMELLARO). From the figures of ROMAN and PÉTOURAUD (1927) only fig. 13 on pl. V shows a conspecific form, the originals of the other two figures (figs. 12 and 14) seem rather to be *L. psilodiscus*. The form figured by DORN (1927, pl. 7, fig. 2) can be assigned, on the basis of its wider whorls, to *L. ferrifex*.

Distribution: This species, originally described from the Upper Bajocian of Normandy, is commonly recorded from both the NW European and Mediterranean regions. Its occurrence in the Mecsek Mts. (S Hungary) is also likely (BÖCKH 1881, p. 39). The Gyenespuszta specimens have been yielded by the Upper Bajocian Subfurcatum to Parkinsoni Zones (Beds 16—13 of Profile VI).

Lissoceras psilodiscus (SCHLOENBACH, 1865)

Pl. XII, figs. 1, 3, Text-fig. 45

1852. *Ammonites Erato* D'ORB. — KUDERNATSCH, p. 10, pl. II, figs. 7—8 (only).
1865. *Ammonites psilodiscus* sp. nov. — SCHLOENBACH, p. 31, pl. 28, fig. 6.
1884. *Lissoceras psilodiscus* — DOUVILLÉ, p. 34, text-fig. 14.
1886. *Ammonites complanatoides* — QUENSTEDT (1886—87), p. 644, pl. 75, fig. 27 (only).
1905. *Haploceras (Lissoceras) psilodiscus* SCHL. — SIMIONESCU, p. 19, pl. II, fig. 7, text-fig. 15.
?1905. *Lissoceras psilodiscus* SCHLOENB. — POPOVICI—HATZEG, p. 20, pl. VI, figs. 2—3.
1914. *Haploceras psilodiscus* SCHLOEN. — ZATWORNITZKY, p. 543, pl. XVII, fig. 23.
non 1924. *Lissoceras psilodiscus* SCHLOENBACH — STEHN, p. 62, pl. IV, fig. 1, text-fig. 4.
1927. *Lissoceras oolithicum* D'ORBIGNY — ROMAN—PÉTOURAUD, p. 48, pl. V, figs. 12, 14 (only).
1935. *Lissoceras psilodiscum* SCHLOENB. — PASSENDORFER, p. 14, pl. II, figs. 5a-b.
?1950. *Lissoceras inflatum* n. sp. et n. subsp. — WETZEL, p. 49, pl. VIII, figs. 6—8.
1951. *Lissoceras psilodiscus* (SCHLOENBACH) — ARKELL (1951—59), p. 49, pl. VIII, fig. 1, text-fig. 10.
1957. *Lissoceras psilodiscus* SCHLOENB. — HIMSHIASHVILI, p. 50, pl. XIV, fig. 1.
1958. *Lissoceras* cf. *psilodiscus* (SCHLOENBACH, 1865) — WESTERMANN, p. 54, pl. 17, figs. 5a-b.
1961. *Lissoceras psilodiscus* (SCHLOENBACH) — STEPHANOV, p. 345, pl. I, fig. 1.
1964b. *Lissoceras psilodiscus* (SCHLOENB.) — STURANI, p. 15, text-fig. 11.
1965. *Lissoceras (Lissoceras) psilodiscum* (SCHLÖNBACH, 1865) — RAKUS, p. 180, pl. XI, figs. 2, 3.
1966. *Lissoceras psilodiscus* (SCHLOENBACH) — STURANI, p. 23, pl. 3, figs. 17a-b, pl. 4, fig. 11.
1968. *Lissoceras psilodiscus* (SCHLOENBACH) — HAHN, p. 66, pl. 4, figs. 1, 2, text-fig. 10.
1970. *Lissoceras psilodiscus* (SCHLOENB.) — GALÁCZ, p. 120.
?1971. *Lissoceras psilodiscus* (SCHLOENBACH) *inflatum* WETZEL — STURANI, p. 92, pl. 6, fig. 1.
1972. *Lissoceras psilodiscus* (SCHLOENBACH) — KRYSTYN, p. 248, text-figs. 15—16.

Material: 3 relatively well-preserved internal moulds and two fragmentary specimens.

Dimensions:

J9284:	68;	33 (48):	17 (25);	13.5 (20)
J9285:	39;	19.5 (50.5);	10 (24.5);	8 (20.5)
J9286:	29;	15 (52);	7 (24);	6 (21)

Description: Small-sized forms with a narrow umbilicus, a convex, oblique umbilical wall and strongly rounded umbilical edge. The flanks are flattened and convergent. The whorl-section (Text-fig. 45) is high, cuneiform, with maximal width near the umbilical edges. The venter is narrow and rounded. The internal mould is smooth, but where the test is partially preserved, fine sigmoid growth-lines are visible. The specimens lack the aperture, suture-lines not visible.

Remarks: This is the most common Bathonian species of the genus *Lissoceras*. It differs from the other congeneric forms with its narrow and high whorl-section, small umbilicus and rounded venter. As shown by HAHN (1968, p. 66), the specimen figured by QUENSTEDT (1886—87, pl. 75, fig. 27) belongs to this species. On the other hand, the South American form figured by STEHN (1924, pl. IV, fig. 1) as *L. psilodiscus* cannot be regarded as conspecific (see ARKELL 1956, p. 585). *L. inflatum* and its subspecies described by WETZEL (1950, p. 81, pl. 8, figs. 7—8) show some differences as compared to the type. The specimens of POPOVICI-HATZEG (1905, pl. VI, figs. 2—3) were separated by several authors from *L. psilodiscus*, and in fact, some minor differences consist in the whorl-thickness and the venter.

Text-fig. 45. Whorl-section of *Lissoceras psilodiscus* (J9284), VI/10, Zigzag Z.

Distribution: This species is one of the most commonly recorded elements of the Lower Bathonian faunas from NW European and Mediterranean regions. Some Upper Bajocian and Middle Bathonian occurrences have also been recorded. At Gyenespuszta, *L. psilodiscus* specimens have been recovered from the Lower Bathonian (Beds 8—11) of Profile VI and the Upper Bajocian of Profile I.

Lissoceras magnum n. sp.

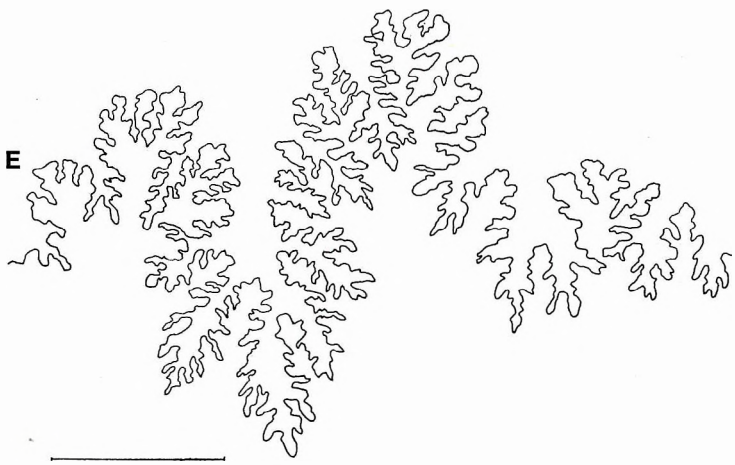
Pl. XII, fig. 2, Text-fig. 46

1970. *Lissoceras* n. sp. — GALÁCZ, p. 120.

Holotype: Pl. XII, fig. 2; J9281.
Locus typicus: Gyenespuszta, Northern Bakony, Transdanubian Central Mountains, Profile VI.
Stratum typicum: Bed 10 of the Lower Bathonian (Zigzagiceras zigzag Zone); ammonitico rosso limestone.
Derivatio nominis: *magnus* (Lat.) = large; after the exceptionally large size of the species.
Diagnosis: Extremely large-sized (max. diameter about 200 mm) *Lissoceras* with subtriangular whorl-section.

Dimensions:					
Holotype,	J9281:	175; 76	(43.5);	62 (35);	41 (23.5)
	J9282:	138; 57	(41);	?49 (?35.5);	43 (31)
		108; 48	(44.5);	37 (34);	27 (25)
		67; 32.5	(48.5);	26 (39);	16 (26)
	J9283:	104; 47	(45);	41 (39.5);	31 (30)
		61; 24	(47.5);	23 (38);	16 (26)

Description: The holotype is a large-sized, well-preserved internal mould. The umbilicus is medium-sized, the umbilical wall is high, slightly convex, the umbilical edge is strongly rounded. The whorl-sides are convex on the inner and flattened on the outer part of the flanks. The venter is narrow and rounded. The whorl-section is subtriangular, with rounded edges, the maximal width can be measured at the inner third of the flanks. The internal mould is smooth, without any visible ornamentation. The holotype is chambered up to about 155 mm diameter. Aperture not visible.



Text-fig. 46. Suture-line of *Lissoceras magnum* n. sp. Holotype (J9281), VI/10, Zigzag Z.

The suture-line (Text-fig. 46) is relatively well-divided. E broad, short, L rather long, slightly asymmetric. L_2 is somewhat shorter, strongly asymmetric. The two auxiliary lobes shorten gradually. ES broad, asymmetrically bifid, with strongly divided inner branch. LS is higher, very broad and finely divided. The auxiliary saddles are lower and more simple.

Remarks: This new species is distinguished from the congeneric forms primarily by its large size. In the shape of the whorl-section it resembles *L. monachum* (GEMMELLARO), but this latter form has a somewhat narrower umbilicus and flattened venter. The single similar form from the previous literature is the taxonomically doubtful *Vastites vastus* described by ARKELL (1951—59, p. 27) from the English Lower Bathonian. Despite the detailed taxonomical discussion of ARKELL it is possible that the curious ammonite in question is an aberrant (keeled) *Lissoceras* specimen, close to the new form described here.

Distribution: The holotype has come from Bed 10 (Lower Bathonian) of Gyenespuszta's Profile VI, other specimen were collected from Bed 11 and Bed 8.

Lissoceras ferrifex (Zittel, 1868)

Pl. XIII, fig. 1, Text-figs. 47, 48

1852. *Ammonites Erato* d'Orb. — Kudernatsch, p. 10, pl. II, figs. 4—5 (only).
1868a. *Ammonites ferrifex* n. sp. — Zittel, p. 604.
1881. *Haploceras vallis calcis* n. sp. — Böckh, p. 39, pl. IX, figs. 8—9.
1927. *Lissoceras oolithicum* d'Orb. — Dorn, p. 245, pl. 7, fig. 3, text-fig. 13.
?1964. *Lissoceras ferrifex* (Zittel) — Wendt, p. 120, pl. 23, fig. 3.
1964b. *Lissoceras ferrifex* (Zitt.) — Sturani, p. 15, text-fig. 10.
1966. *Lissoceras ferrifex* (Zitt.) — Dieni et al., p. 102, pl. I, fig. 4.
1970. *Lissoceras ferrifex* (Zittel) — Galácz, p. 120.
1972. *Lissoceras ferrifex* (Zittel) — Krystyn, p. 250, pl. 6, fig. 3, text-fig. 15.

Material: 7 relatively well-preserved internal moulds and some fragmentary specimens.

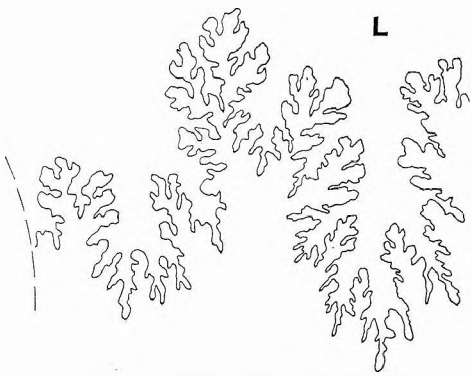
Dimensions:

J9288:	119;	52 (49);	43 (36);	32 (27)
J9289:	85;	41 (48);	27 (32);	19 (22.5)
J9287:	83;	40 (48);	29 (36);	21.5 (26)
J9292:	78;	36 (46);	?24 (?31);	20 (26)

Description: Medium-sized form with a moderately wide umbilicus, a perpendicular umbilical wall and a rounded umbilical edge. The whorl-sides are slightly convex, the venter is rounded. The whorl-section (Text-fig. 47) is oval, with maximal width at the lower third of the whorl-height. The internal mould is smooth. The body-chamber begins at 65 to 75 mm diameter; aperture not preserved.

The characteristically haploceratid suture-line (Text-fig. 48) is relatively simple. L is deep, tapering, three-pronged. L_2 asymmetric, shorter than L. LS is high, wide and asymmetric with a

Text-fig. 47. Whorl-section of *Lissoceras ferrifex* (J9291), VI/6, Subcontractus Z.



Text-fig. 48. Suture-line of *Lissoceras ferrifex* (J9288), VI/5, Subcontractus Z.

longer and more finely divided internal branch. The single auxiliary saddle is shorter and similarly asymmetric.

Remarks: This species of Zittel (1868a, p. 604), which was based on the figures of Kudernatsch (1852, pl. II, figs. 4—5), differs from the other congeneric forms with its perpendicular umbilical wall, oval whorl-section and convex whorl-sides. The nearest species is *L. oolithicum* (d'Orbigny), but besides the differences mentioned above, the two forms differ in the suture-line too. The sutural differences were mentioned even by Zittel, in his designation. *L. ferrifex* shows only a single auxiliary saddle, while *L. oolithicum* bears several auxiliary elements. On the basis of this feature the record of Wendt (1964, pl. 23, fig. 3) is doubtful. The type of *Haploceras vallis calcis* (Böckh 1881, p. 39, pl. IX, figs. 8—9) from the Mecsek Mountains shows no difference, therefore—as recently suggested by Krystyn (1972, p. 250)—it is a synonym of *L. ferrifex*.

Distribution: The type has come from the condensed Bathonian bed of Swinitza. Subsequent records quoted this form from the Tethyan Middle and Upper Bathonian. At Gyenespuszta this species occurs in the Middle and Upper Bathonian (Beds 8—5) of Profile VI.

Familia **Oppeliidae** BONARELLI, 1894
Subfamilia *Oppeliinae* BONARELLI, 1894

Genus OPPELIA WAAGEN, 1869

Genotype: *Am. subradiatus* J. DE C. SOWERBY (1823, p. 23, pl. 421, fig. 2). The type, as lectotype, was designated by DOUVILLÉ (1884, p. 32). The holotype of *Oppelia subradiata* was figured and described by ARKELL (1951—59, pp. 50—51, text-fig. 11).

General remarks: The genus *Oppelia*, with inclusion of several subgenera, was earlier regarded as a long-ranged, wide group (see in ARKELL loc. cit., 1957). According to the recent interpretations the Bathonian forms *(Oxycerites)* can be regarded as a separate genus, and, on the other hand, numerous Bajocian forms (e.g. *Pleuroxyites, Flexoxyites, Amblyoxyites*, all BUCKMAN) should be included as synonyms in *Oppelia* s.s. In this way, *Oppelia* unites mainly Bajocian forms with a relatively wide umbilicus, slightly convex flanks, closely-spaced, short outer ribs and a venter which is tectiform in the phragmocone and rounded on the body-chamber. According to ARKELL's remark (loc. cit. p. 51), the suture-line of *Oppelia* s.s. is characterized by four auxiliary lobes.

The question of the origin of the genus coincides with the problem of ancestry of the family Oppeliidae. The earlier views were reviewed by ARKELL (loc. cit. pp. 47—48). In the Treatise (ARKELL 1957, pp. L274—275) he suggested a connection with the Hammatoceratidae, regarding *Bradfordia* as a transitional early oppeliid. Similar conclusion was drawn by GÉCZY (1967), ELMI (1967) and, subsequently, WESTERMANN (1969), who regarded *Pseudaptetoceras, Euaptetoceras* and *Eudmetoceras* as ancestral forms of the *Bradfordia*. Recently STURANI (1971) queried the Hammatoceratidae-*Bradfordia-Oppelia* origination, suggesting for *Bradfordia* and *Lissoceras*, a graphoceratid ancestry. He regarded *Hebetoxyites* as an ancestral oppeliid genus. The transfer of this latter genus to the Oppeliidae seems to be justified, but, the solution of the problems, with the correct place of *Bradfordia*, needs further studies.

Distribution: Earliest *Oppelia* s.s. species appear in the Lower Bajocian Sowerbyi Zone [*O. amblys* (BUCKMAN)], and the genus is most common in the Middle and Upper Bajocian. Members of this genus are common both in the Mediterranean and NW European areas.

Dimorphism: *Oppelia* includes macroconch forms. In the case of the Middle and Upper Bajocian species, corresponding microconchs should be searched for the genus *Oecotraustes* (incl. *Oppelina*) (see ELMI 1967; STURANI 1971). In the present state of knowledge the matching of the early, Lower Bajocian forms is rather uncertain.

Oppelia cf. **flexa** (BUCKMAN, 1924)

Pl. XIII, fig. 2, Text-fig. 49

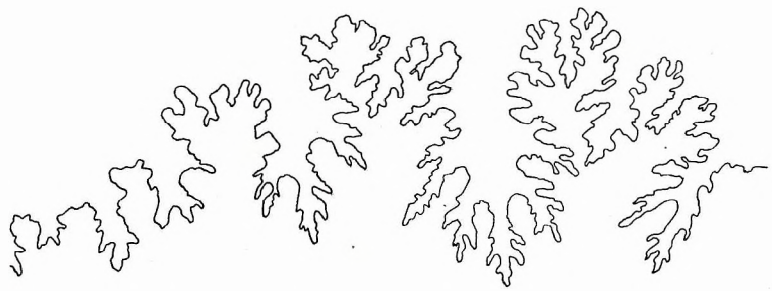
1869. *Ammonites subradiatus* SOW. — WAAGEN, p. 193, pl. 16, fig. 3 (only).
1912. *Oppelia subradiata* SOW. Variété A. — FAVRE, p. 11, pl. I, fig. 1a (only).
1919. *Oppelia subradiata* SOW. — DE GROSSOUVRE, p. 397, pl. XIII, fig. 7.
1924. *Flexoxyites flexus* nov. — BUCKMAN (1909—30), pl. 525A-B.
1939. *Oppelia flexa* BUCKMAN sp. — ROCHÉ, p. 165, pl. VI, figs. 1—2.
1964b. *Oppelia* gr. *subradiata* auct. — STURANI, p. 18, pl. II, fig. 4 (only).
1970. *Oppelia subradiata* (SOW.) — GALÁCZ, p. 118 (pars).
1971. *Oppelia flexa* (S. BUCKMAN) — STURANI, p. 114, pl. 6, fig. 14, pl. 7, fig. 1.
1972. *Oppelia (O.) flexa* (S. BUCKMAN) — PAVIA, p. 98, pl. 16, figs. 5, 7.

Material: A single, fragmentary, poorly preserved specimen.
Dimensions: J9296: 100; 57 (57); 25 (25); 12 (12)

Description: Medium-sized species with a relatively wide umbilicus, a perpendicular umbilical wall and a slightly rounded umbilical edge. The whorl-section is high, with somewhat convex whorl-sides and a blunt venter. The ribbing can be seen only in the last quarter of a whorl. Here the adult ribbing consists of low, short, arched secondaries. The venter is unkeeled and shows a relatively wide smooth outer band. The specimen is an entirely chambered phragmocone, without body-chamber.

The suture-line is typically oppeliid, but cannot be seen clearly.

Remarks: According to STURANI (1971) and PAVIA (1972, p. 98), *O. flexa* differs from the other congeneric forms in having a stouter shorl-section, relatively wide umbilicus, a rounded and smooth venter and different ribbing. The ribbing of the Gyenespuszta specimen cannot be seen clearly, but the other characteristics are recognizable. Because of the poor state of preservation, this specimen can be assigned only with uncertainty into this species.



Text-fig. 49. Suture-line of *Oppelia* cf. *flexa* (J9296), VI/13, Parkinsoni Z.

Distribution: The holotype came from the Bajocian of Normandy (BUCKMAN 1909–30, pl. 525A) (the suture-line of the type specimen was figured earlier by WAAGEN, 1869, pl. 16, fig. 3). The paratype (BUCKMAN, loc. cit. pl. 525B) was collected from the Subfurcatum Zone of Dorset, southern England. Other records refer to upper Humphriesianum to Parkinsoni Zones. The specimen described here has come from Bed 13, i.e. from upper Parkinsoni Zone of Profile VI.

Genus OXYCERITES ROLLIER, 1909

Type species, by original designation (ROLLIER 1909, p. 621), is *Am. aspidoides* OPPEL (1857, p. 474). The holotype (OPPEL 1862, pl. 47, figs. 4a-b) was refigured by WESTERMANN (1958, pl. 6, figs. a-b).

Oxycerites plicatella (GEMMELLARO, 1877)

Pl. XIII, fig. 4, Pl. XIV, figs. 1–2, Text-figs. 50, 51

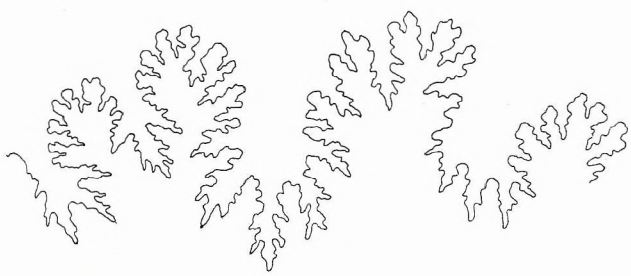
1877. *Oppelia plicatella* GEMM. — GEMMELLARO, p. 62, pl. III, figs. 6–7 (only).
1964. *Oppelia (Oxycerites) plicatella* (GEMM.) — WENDT, p. 122, pl. 19, fig. 1.
1964b. *Oppelia (Oxycerites) plicatella* (G. GEMMELLARO) — STURANI, p. 19, text-fig. 16.
1970. *Oppelia subradiata* (SOW.) — GALÁCZ, p. 118 (pars).
1970. *Oxycerites plicatella* (GEMM.) — GALÁCZ, p. 119.

Material: 11 relatively well-preserved internal moulds and several fragmentary specimens.

Dimensions:				
J9304:	120;	67 (56);	28 (23.5);	9.5 (7.9)
J9300:	102;	59 (57);	23 (22);	8.2 (8.1)
J9298:	80;	46 (57.5);	19 (24);	5 (6.3)
J9299:	64;	35 (55);	16 (25);	6 (9.5)
J9303:	50;	29 (57);	?12 (?24);	5 (10)

Description: Discoidal, involute ammonite with a narrow umbilicus, a vertical umbilical wall and a somewhat rounded umbilical shoulder. The whorl-section is high, wedge-shaped with convergent whorl-sides and a slight spiral ridge on the midflanks of the inner and middle whorls

Text-fig. 50. Whorl-section of *Oxycerites plicatella* (J9297), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 51. Suture-line of *Oxycerites plicatella* (J9300), VI/16, Subfurcatum and Garantiana Z.

(Text-fig. 50). On the outer whorls the flanks are flattened. The venter is fastigate on the inner and middle whorls, on the outer whorls the ventrolateral edges become rounded and the venter is high, narrowly arched, and the body-chamber is rounded. The ribbing of the inner whorls is coarser and comprises falcoid primary and strongly projected, short secondary ribs. On the middle whorls the ribs become fainter and the outer whorls bear only the curved outer parts of the primaries. The body-chamber is nearly smooth.

Entire suture-line not seen, but visible parts (Text-fig. 51) suggest a rather complicated suture as compared to those of other congeneric forms.

Remarks: The species *Oxycerites plicatella* differs from the other congeneric forms in having a narrower umbilicus, flattened whorl-sides, a fastigate venter, almost smooth outer whorls and more complicated septal sutures. The lectotype (GEMMELLARO 1877, pl. 18, fig. 6) was designated and firstly figured in lateral view by WENDT (1964, p. 122, pl. 19, fig. 1).

Distribution: The type of this rarely recorded Tethyan species came from condensed Upper Bajocian—Bathonian beds of Sicily. STURANI (1964b) described some specimens from the Upper Bajocian and Bathonian of the Venetian Alps. At Gyenespuszta the specimens have come from the Upper Bajocian (Beds 16 to 14 in Profile VI).

Oxycerites cf. **oxus** (BUCKMAN, 1926)

Pl. XIV, fig. 5

1926. *Micromphalites oxus*, nov. — BUCKMAN (1909—30), pl. 654.
1951. *Oppelia (Oxycerites) oxus* (S. BUCKMAN) — ARKELL (1951—59), p. 66, pl. VI, figs. 8—9, text-fig. 16/2.
1966. *Oppelia (Oxycerites) oxus* (S. BUCKMAN) — STURANI, p. 25, pl. 4, fig. 9.
non 1968. *Oppelia (Oxycerites) oxus* (BUCKMAN) — TSERETELI, p. 57, pl. IV, fig. 1.
1970. *Oxycerites* sp. — GALÁCZ, p. 120 (pars).

Material: A single, fragmentary specimen.
Dimensions: J9305: 111; 58 (52); 27 (24.5); 12.5 (11)

Description: The specimen is an incomplete internal mould, showing a part of the inner whorls and a half-whorl of the body-chamber. The umbilicus is relatively wide, deep, with a perpendicular umbilical wall and a somewhat rounded umbilical margin. The whorl-sides are flattened, the venter is keeled in the inner whorls but roundep on the body-chamber. The venter gradually becomes widely-arched at greater diameters. The whorl-section is high and acute, with maximal thickness near the lower third of the flanks. The ribbing is visible only on the inner whorls, where prorsiradiate, posteriorly arched, short, dense secondary ribs occur. The body-chamber is completely smooth. No sutures are visible.

Remarks: On the basis of the description given by ARKELL (1951—59, pp. 66—67), the characteristic features of this species are the relatively wide umbilicus and the somewhat irregular ribbing. Owing to the imperfect state of preservation of the Gyenespuszta specimen, these features are poorly recognizable, hence the arrangement is somewhat uncertain.

Distribution: The few figured specimens of this relatively rare species occurred in the English and SW Alpine Bathonian. The holotype came from the Stonesfield Slates (Progracilis Zone) of Southern England. The specimen described by STURANI from Digne (SE France) occurred also in this lower zone of the Middle Bathonian. The other records from France (MANGOLD et al. 1967, p. 110) and Portugal (ELMI et al. 1971, p. 444) refer to this zone, too. The Upper Bathonian record from Georgia (TSERETELI 1968) is based on a misidentification, the figured specimen being a strongly ribbed *Oecotraustes (Paroecotraustes)* sp.

The Gyenespuszta specimen has come from Bed 8, i.e. from the Progracilis Zone of Profile VI.

Genus OECOTRAUSTES WAAGEN, 1869

Type species: *Oecotraustes genicularis* WAAGEN (1869, p. 227, pl. XX, figs. 4a-c), designated subsequently by MUNIER-CHALMAS (1892, p. CLXXI). The lectotype of the type species was designated by ARKELL (1951, p. 7) (see STEPHANOV 1966, p. 38).

General remarks: The genus *Oecotraustes* was introduced by WAAGEN (1869, p. 251) for a group of characteristic small ammonites. Subsequent authors repeatedly treated the systematics of this group, and the revision of STEPHANOV (1966) could be regarded as most acceptable, because his subgeneric subdivision fits best with both morphology and stratigraphic distribution.

Distribution: Earliest representative of the genus *(O. genicularis)* appears in the basal Humphriesianum Zone (Romani Subzone, see e.g. PARSONS 1976). The nominate subgenus ranges from the uppermost Bajocian to the lowermost Bathonian. The genus itself, with its subgenus *Thraxites*, continues up to the Middle Callovian. *Oecotraustes* is a characteristically NW European genus, with relatively rare records from Mediterranean areas. It is well reflected by the Gyenespuszta fauna, where two specimens occurred altogether.

The proved basal Humphriesianum Zone occurrence of the early *Oecotraustes* raises again the question that this genus has phylogenetic connection to the Lower Bajocian genus *Protoecotraustes* BUCKMAN. This possibility has been rejected partly on the basis of the stratigraphic gap between the two genera (SAPUNOV 1963) and partly on account of morphologic differences (ELMI 1967, p. 785).

Dimorphism: As early as in the original definition by WAAGEN do references to microconchiate features, i.e. presence of lateral lappets, appear. All earlier students of dimorphism mentioned the dimorphism of this genus (see in ARKELL 1951—59, pp. 53—54). STEPHANOV (1966, pp. 34—37) rejected the dimorphous pairing of *Oecotraustes* on generic rank (see in MAKOWSKI 1963, CALLOMON 1963, WESTERMANN 1964), and suggested the possibility of intraspecific matches. ELMI paired the distinct *Oecotraustes* subgenera as microconchs of various subgenera from the subfamilies Oppeliinae and Hecticoceratinae (1967, pp. 785—786, fig. 206). STURANI (1971) was inclined to accept matches between species within certain subgenera.

The problem of dimorphism of *Oecotraustes*, as well as that of all Oppeliidae will remain an open question until a stratigraphically well-established, and morphologically less arbitrary systematics of this family is developed.

Oecotraustes (Oecotraustes) costiger BUCKMAN, 1905

Pl. XIII, fig. 3

1888. *Oecotraustes conjugens* (K. MAYER) — BUCKMAN (1887—1907), pl. XX, figs. 15—17 (only).
1905. *Oecotraustes costiger* S. BUCKMAN — BUCKMAN, p. CXCIV, figs. 190a-b.
1951. *Oecotraustes (Oecotraustes) costiger* S. BUCKMAN — ARKELL (1951—59), p. 67, pl. VII, figs. 3—6.
1959. *Oecotraustes (Paroecotraustes) formosus* ARKELL — SAPUNOV—NACHEV, p. 60, pl. VI, fig. 8 (only).
1966. *Oecotraustes (Oecotraustes) costiger* S. BUCKMAN — STEPHANOV, p. 40, pl. I, figs. 5—7.
1970. *Oecotraustes* sp. — GALÁCZ, p. 119.

Material: A single fragmentary internal mould.
Dimensions: J9294: 34; 16 (47); 9 (26.5); 8 (23.5)

Description: Small form with narrow, moderately deep umbilicus. The umbilical edge is rounded. The flanks are slightly convex and form rounded ventrolateral edges with the narrow, sharp, carinate venter. The whorl-section is compressed, with maximal thickness at the lower third of the whorl-height. Owing to the imperfect state of preservation, the ribbing cannot be seen clearly. On the inner half of the flanks of the last whorl there are wide, low prorsiradiate ribs. On the outer third of the whorl-side there are densely-spaced, short, slightly arched, rursiradiate outer ribs, which end on the ventrolateral edge abruptly, with a small node. The specimen is a phragmocone fragment (with a maximum of 40 mm in diameter), accordingly, the entire form is a comparatively large one. Body-chamber and aperture are not preserved, suture-lines not visible clearly.

Remarks: In his monograph on the *Oecotraustes*, STEPHANOV (1966) treated this species and its synonymy in detail. He emphasized the large size as distinctive feature. The Gyenespuszta specimen of 40 mm preserved diameter agrees well with the type (lectotype: BUCKMAN 1887—1907, pl. XX, figs. 15—16, designated and refigured by ARKELL 1951—59, p. 67, pl. VII, fig. 6, see STEPHANOV loc. cit. pl. I, fig. 6) in size and dimensions. The ribbing is somewhat weaker, but it seems to have been due to the lack of the test of this specimen.

Distribution: The precise stratigraphical range of this species, characteristic in NW European faunas, was cleared up by STEPHANOV (1966). In contrast to the Upper Bajocian—Lower Bathonian range suggested by ARKELL (1951—59, p. 67), STEPHANOV narrowed this vertical distribution down to the upper Parkinsoni Zone. This viewpoint was later confirmed by TORRENS (1967). The specimen of Gyenespuszta also has come from the uppermost Bajocian, i.e. from the upper part of the Parkinsoni Zone (Bed 13 of Profile VI).

* * *

Bed 16 of Profile VI (Subfurcatum and Garantiana Zones) has yielded a very poorly preserved, fragmentary *Oecotraustes* specimen (Pl. XIII, fig. 5) (see GALÁCZ 1970, p. 118), which resembles *O. (O.) costiger* BUCKMAN by its size and ribbing. Any closer determination is impossible.

Subfamilia *Hecticoceratinae* SPATH, 1925

Genus PROHECTICOCERAS SPATH, 1928

Type species, by original designation (SPATH 1927—33, p. 100), *Am. retrocostatus* DE GROSSOUVRE (1888, p. 374, pl. III, figs. 8—9). As ARKELL (1957, p. L276) noted, the type species is an atypically stout, heavily ribbed form.

General remarks: The taxonomic status of *Prohecticoceras* is a rather controversial subject. The most recent and detailed revision is given by ELMI (1967). According to him, *Prohecticoceras* is a subgenus of *Hecticoceras*, differing with its strong, proverse inner and several outer ribs. However, some facts seem to be inconsistent with this subgeneric arrangement.

By virtue of the original diagnosis by SPATH (loc. cit.), the most characteristic *Prohecticoceras* feature is the strongly depressed, almost tabulate venter. With this distinctive feature the group differs well from *Eohecticoceras* ZEISS 1959 of acute venter. Another *Prohecticoceras* feature is the appearance of small perimarginal nodes at the termination of the secondary ribs—a character distinguishing *Prohecticoceras* from *Zeissoceras* ELMI 1967 of rounded ventrolateral edge. It is within this latter group, especially around *E. (Z.) primaevum* and its allies, that the ancestral forms of *Prohecticoceras* should be traced. According to the above features, *Prohecticoceras* can be easily distinguished from the other Bathonian Hecticoceratinae.

Relatively obscure is the situation with the Callovian forms. For a certain group of the Callovian Hecticoceratinae, ZEISS (1956, p. 24) introduced the subgenus *Zieteniceras*, with "*H.*" *zieteni* as subgenotype. Subsequently, ZEISS (1959) assigned several Callovian forms to this subgenus. ELMI (1967, p. 580) regarded *Zieteniceras* as synonym of *Prohecticoceras*. However, from all of the *Zieteniceras* species only "*Z.*" *angulicostatum* (LÓCZY) can be assigned to *Prohecticoceras*. The type figure of "*Z.*" *zieteni* (DE TSYTOVITCH 1911, pl. I, fig. 2) does not show the venter, and on the subsequent figures of this species (e.g. ZEISS 1956, pl. 4, fig. 5; ELMI 1967, text-figs. 135/1—2, 10) the venter seems to be rather tectiform. "*Hecticoceras*" *zieteni*, on the basis of its ribbing, could be a Middle Callovian *Prohecticoceras*-homoeomorph. Similarly controversial is the generic or subgeneric state of other Lower and Middle Callovian "*Prohecticeras*" species of ELMI. Some forms (e.g. "*P.*" *eugenei*), with their lateral spiral depression appear to be *Chanasia*-allies, others (e.g. "*P.*" *pseudolunula*), with the feeble inner ribs, seem to be close to *Lunuloceras*. With exclusion of these forms, *Prohecticoceras* and *Hecticoceras* s.s. lack the real stratigraphic and morphologic transition, therefore the treatment of *Prohecticoceras* as an independent genus seems to be reasonable.

Distribution: The earliest *Prohecticoceras* appear in the Lower Bathonian Macrescens Subzone (ELMI 1971), and the genus survives well into the Lower Callovian. Lower and Middle Callovian forms need further study (see above). The representatives of *Prohecticoceras* show a rather extended areal distribution, but seem to be more common in Tethyan regions (for a detailed discussion of *P. retrocostatum*, see TORRENS 1972).

Dimorphism: According to ELMI (1967, p. 789, fig. 206), the microconchiate pairs of the Bathonian *Prohecticoceras* should be traced within the genus *Paroecotrauste*s. On morphologic ground this matching appears to be justified, but any more detailed pairing would presuppose a more accurate knowledge of the stratigraphic ranges of the Bathonian and Lower Callovian Hecticoceratinae.

Prohecticoceras ochraceum ochraceum ELMI, 1967

PL. XIV, figs. 3—4, Text-figs. 52, 53

1930. *Hecticoceras retrocostatum* DE GROSSOUVRE — ROMAN, p. 24, pl. VIII, fig. 9 (only).
1935. *Hecticoceras (Ludwigia) retrocostatum* DE GROSS. — PASSENDORFER, p. 15, pl. III, fig. 4.
1967. *Hecticoceras (Prohecticoceras) ochraceum* nov. sp. — ELMI, p. 584, pl. 5, figs. 1—2, text-figs. 122—127.
1970. *Prohecticoceras ochraceum ochraceum* ELMI — GALÁCZ, p. 121.
1971. *Hecticoceras (Prohecticoceras) ochraceum* ELMI, 1967 — ELMI, p. 250, pl. 19, figs. 2—5, text-fig. 1.

Material: 3 relatively well-preserved internal moulds.

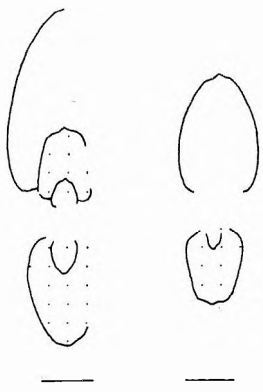
Dimensions:				
J9306:	71;	37 (52);	21 (29.5);	11 (15.5)
	50;	24 (48);	17 (34);	10 (20)
J9307:	46;	22.5 (49);	16 (35);	12 (26)

Description: Medium-sized form with a relatively wide umbilicus, high and vertical umbilical wall. The umbilical edge is slightly rounded. The whorl-sides are somewhat convex and form a rounded ventrolateral edge with the narrow, low, carinate venter. The whorl-section (Text-fig. 52) is high trapezoidal with its maximal width at the inner third of the flanks. The prorsiradiate inner ribs are short and strong, bi- or trifurcate at the inner third of the whorl-side. The longer,

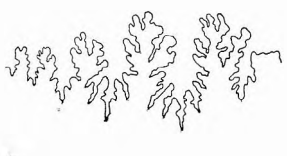
curved, rursiradiate secondary ribs end abruptly at the ventrolateral edge. At 46 mm diameter a half-whorl bears 12 primary and 27 secondary ribs. On the body-chamber, which begins at 50 mm diameter, the ribbing becomes fainter. Parallel with the weakening of the ornamentation, the venter becomes smooth and rounded. The aperture is not preserved.

The suture-line (Text-fig. 53) is relatively simple. E is wide and short, L deeper and wide, slightly irregularly three-pronged, other lateral lobes are gradually simpler and shorter. The saddles are asymmetrically two-branched, LS is the highest.

Remarks: *P. ochraceum* differs from the congeneric forms with its fastigate, not flattened venter and numerous secondary ribs. The nominate subspecies is distinguished from the *P. o. blanazense* ELMI by its relatively wider umbilicus. The specimens from Gyenespuszta show good resemblance to the holotype (ELMI 1967, pl. 5, figs. 1a-b), some differences are only in the number of the ribs.



Text-fig. 52. Whorl-sections of *Prohecticoceras ochraceum ochraceum* (a: J9307, b: J9442), VI/3, Subcontractus Z.



Text-fig. 53. Suture-line of *Prohecticoceras ochraceum ochraceum* (J9306), VI/3, Subcontractus Z.

The number of the primaries of the specimens figured here is greater, while the number of the secondaries is smaller than on the type. On the other hand, ELMI included in this species two previously figured forms from the literature (ROMAN 1930, pl. VIII, fig. 9 and PASSENDORFER 1935, pl. III, fig. 4), which show similar differences in this feature. On the basis of this fact, the Gyenespuszta specimens can be undoubtedly assigned to *P. o. ochraceum*.

Distribution: This species is recorded from both Mediterranean and NW European localities. In the type area (Ardèche, E France) it occurs in the Middle Bathonian Subcontractus Zone. At Gyenespuszta the specimens were collected also from this zone (Beds 3 and 5, Profile VI).

Superfamilia **Stephanocerataceae** NEUMAYR, 1875
Familia **Stephanoceratidae** NEUMAYR, 1875

Genus CADOMITES MUNIER-CHALMAS, 1892

Subgenus CADOMITES (CADOMITES) MUNIER-CHALMAS, 1892

Type species, by original designation (MUNIER-CHALMAS 1892, p. CLXXII), *Am. deslongchampsi* D'ORBIGNY (1842—51, p. 405, pl. 138, figs. 1—2), from the Upper Bajocian of Bayeux, Normandy. The lectotype (designated by BIGOT 1904, p. 254) was refigured by DOUVILLÉ 1909, No. 21; ROCHÉ 1939, pl. I, fig. 6; ARKELL 1951—59, text-fig. 21.

General remarks: According to the modern interpretation, the subgenus *Cadomites* comprises Upper Bajocian—Bathonian stephanoceratids with a coronate whorl-section, slightly contracted body-chamber and sharp, dense ribbing. The apertural margin is characteristically macroconchiate, with collar.

The first *Cadomites* appear in the uppermost Humphriesianum Zone (*C. lissajousi lissajousi* ROCHÉ, see PAVIA 1972, pp. 100—101), and the genus itself is a common, differentiated element in basal Subfurcatum Zone to Upper Bathonian faunas. The earliest *Cadomites* differ merely with their finer and sharper ribbing and contracted body-chamber from the probable ancestral *Stephanoceras*

s.s. (WESTERMANN—RIOULT 1975, p. 876). At another Bakony Mts. locality, Lókút, the uppermost Humphriesianum Zone yielded several forms of transition between *Stephanoceras* and *Cadomites* (GALÁCZ 1976, p. 181), thus providing a probable means for clearing up the connections of these genera.

Distribution: The species of the genus *Cadomites* form a stratigraphically continuous lineage in the Upper Bajocian and Bathonian. ARKELL (1951—59, p. 81) supposed the survival of this genus into the Lower Callovian, but undisputable records do not prove this extended occurrence (see below).

Dimorphism: The *Cadomites-Polyplectites* dimorphic pair is one of the classical and long-recognized macroconch-microconch matches. The pairing of the individual species is still lacking, but studies on rich and stratigraphically well-documented faunas will undoubtedly result in closer correlations.

Cadomites (Cadomites) deslongchampsi (D'ORBIGNY, 1846)

Pl. XV, fig. 1, Text-fig. 54

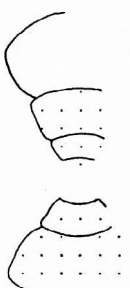
1846. *Ammonites Deslongchampsi* (DEFRANCE) — D'ORBIGNY (1842—51), p. 405, pl. 138, figs. 1—2.
1927. *Cadomites Deslongchampsi* DEFRANCE — ROMAN—PÉTOURAUD, p. 44, pl. VII, fig. 5.
?1927. *Cadomites Deslongchampsi* DEFRANCE — ROMAN—PÉTOURAUD, p. 45, pl. VI, figs. 10—12.
1939. *Cadomites Deslongchampsi* DEFRANCE — ROCHÉ, p. 201, pl. I, figs. 6, 8, 9 (only).
non 1946. *Cadomites Deslongchampsi* DEFRANCE in D'ORBIGNY — GARDET—GÉRARD, p. 34, pl. VIII, figs. 3—4.
1952. *Cadomites deslongchampsi* (D'ORBIGNY) — ARKELL (1951—59), p. 79, text-fig. 21.
?1952. *Cadomites* cf. *deslongchampsi* (D'ORBIGNY) — ARKELL (1951—59), p. 80, pl. IX, fig. 3.
non 1961. *Stephanoceras (Cadomites) deslongchampsi* DEFRANCE — KRYMHOLZ, p. 119, pl. VIII, figs. 2—3.
?1963. *Cadomites deslongchampsi* (D'ORBIGNY) — STEPHANOV, p. 175, pl. I, figs. 1a-c.
non 1963. *Stephanoceras (Cadomites) deslongchampsi* (DEFRANCE) — AZARIAN, p. 196, pl. XIII, figs. 1—2.
1964b. *Cadomites deslongchampsi* (DEFRANCE in D'ORBIGNY) — STURANI, p. 19, pl. II, figs. 7A-B, text-fig. 18.
1966. *Cadomites deslongchampsi* (DEFRANCE in D'ORBIGNY) — STURANI, p. 28, pl. 6, fig. 1.
1968. *Cadomites deslongchampsi* (ORBIGNY) — TSERETELI, p. 74, pl. VIII, figs. 1—2 (only).
1969. *Cadomites deslongchampsi* (ORB.) — MIHAJLOVIČ, p. 65, pl. V, figs. 1—1a.
1970. *Cadomites deslongchampsi* (D'ORB.) — GALÁCZ, p. 119.
1971. *Cadomites (Cadomites) deslongchampsi* (D'ORBIGNY) — HAHN, p. 111, pl. 9, fig. 16.
non 1972. *Cadomites (?C.)* cfr. *deslongchampsi* (DEFRANCE in D'OBRIGNY) — PAVIA, p. 103, pl. 16, fig. 6.
1975. *Cadomites (Cadomites) deslongchampsi* (D'ORBIGNY) — PARSONS, p. 195, pl. 36, figs. 1a-b, text-fig. 4.

Material: 5 relatively well-preserved specimens.

Dimensions:

J9325:	90;	36 (40);	?44 (?52);	37 (41)
J9323:	60;	22 (37);	34 (57);	25 (42)
J9326:	55;	18 (33);	25 (45.5);	23.5 (43)
J9324:	54;	20 (37);	?28 (?52);	20.5 (38)

Description: Medium-sized, well-preserved internal mould with traces of the original shell. The umbilicus is wide, evenly deepening. The flanks are low and meet the flattened venter in a rather sharp ventrolateral edge. The whorl-section (Text-fig. 54) is trapezoidal, with greatest thickness between the ventrolateral edges. The primary ribs starting from the umbilical seam, are sharp on the shell but blunter on the internal mould. At the ventrolateral edge the primaries form marked tubercules and branch into three secondary ribs. The secondary and the appearing intercalatory ribs are sharp, lamellar on the shell, but also blunter on the internal cast. On the last preserved whorl (at 60 mm diameter) there are 38 primary ribs. Another, bigger, but fragmentary specimen shows a 2/3 whorl long body-chamber, which begins at about 60 mm. On this latter specimen the primaries are heavily projected and more densely spaced near the aperture. However, neither the aperture, nor the suture-line is visible on the specimens.



Text-fig. 54. Whorl-section of *Cadomites (C.) deslongchampsi* (J9323), VI/16, Subfurcatum and Garantiana Z.

Remarks: The earliest literature of this type-species of the genus *Cadomites* was discussed by ROCHÉ (1939) and ARKELL (1951—59) in detail. On the basis of ARKELL's arguments, the author of this species is D'ORBIGNY.

The basic specific feature of *C. deslongchampsi* is the trapezoidal whorl-section with flattened venter and the relatively wide umbilicus. Of similar size and ribbing, *C. rectelobatus* (HAUER) differs by its greater whorl-width and more arched venter in all stages. From the forms described earlier under this name those nuclei of ROMAN and PÉTOURAUD (1927, pl. VI, figs. 10—12) are specifically indeterminable. ROCHÉ (1939, pl. I, figs. 4, 6—9) figured 5 specimens, but only those on pl. I, fig. 6 (lectotype) and figs. 8 and 9 belong certainly to this species. Pl. I, fig. 4 shows a small specimen with a very narrow umbilicus, and pl. I, fig. 7 similarly a distinct species, characterized by a narrow umbilicus, a strongly contracted body-chamber and thinly collared peristome. According to ARKELL (1956, p. 263), the form figured by GARDET and GÉRARD is a *Cadomites* sp. indet; but this body-chamber frag-

ment closely resembles *C. rectelobatus* (HAUER). The English Lower Bathonian form of ARKELL (1951—59, pl. IX, fig. 3) can be equally a *C. exstinctus* specimen.

The specimens described from the Caucasus also cannot be assigned to this species. On the basis of their whorl-section and ribbing, the specimens figured by KRYMHOLZ (1961, pl. VIII, figs. 2—3) rather belong to *Cadomites psilacanthus* (WERMBTER). On the other hand, the figures of AZARIAN (1963, pl. XIII, figs. 1—2) show closest resemblance to *C. daubenyi* (GEMMELLARO). The Bulgarian specimen (STEPHANOV 1963, p. 175, pl. I, figs. 1a-c) shows strongly excentric coiling and a rounded whorl-section, therefore the inclusion here is doubtful. From the specimens of TSERETELI (1968, pl. VII, figs. 4a-b, pl. VIII, figs. 1—2) only the two body-chamber fragments on pl. VIII, figs. 1 and 2 can be included in *C. deslongchampsi*, while the larger specimen (pl. VII, figs. 4a-b) shows a different whorl-section and more widely spaced ribs. The Upper Bajocian specimen figured by PAVIA (1972, pl. 16, fig. 6) from SE France, certainly belongs to the subgenus *Polyplectites*.

D i s t r i b u t i o n : The species has been mentioned from both NW Europe, and the Mediterranean region. The horizon of the type from Bayeux (France)—according to ARKELL (1951—59, pp. 80—82)—is Parkinsoni Zone. On the basis of the literature, this species is most common in the uppermost Bajocian and the basal Bathonian. The specimens of Gyenespuszta have come from the Garantiana to Zigzag Zones (in Profile VI, Beds 16 to 11).

Cadomites (Cadomites) daubenyi (GEMMELLARO, 1877)

Pl. XV, fig. 5, Text-figs. 55, 56

	1877.	*Stephanoceras Daubenyi* GEMM. — GEMMELLARO, p. 67, pl. IV, figs. 3—5, pl. IVbis, fig. 1.
	1912.	*Stephanoceras Daubenyi* GEMMELLARO — BOEHM, p. 148, text-fig. 65 (only).
non	1922.	*Polystephanus daubenyi* GEMMELLARO sp. — BUCKMAN (1909—30), pl. 311.
non	1923.	*Cadomites Daubenyi* GEMMELLARO — LISSAJOUS, p. 105, pl. XXIII, fig. 1.
	?1930.	*Cadomites daubenyi* GEMMELLARO — ROMAN, p. 25, pl. VIII, fig. 5.
non	1937.	*Polystephanus daubenyi* BUCKMAN (1910) 1922 — WETZEL, p. 81, text-fig. 1.
non	1939.	*Cadomites Daubenyi* GEMMELLARO sp. — ROCHÉ, p. 203, pl. I, fig. 3.
	1955.	*Polyplectites daubenyi* GEMMELLARO — MAUBEUGE, p. 40, pl. 8, figs. 2a-b.
non	1958.	*Cadomites (Polystephanus) daubenyi* GEMM. — COLLIGNON, pl. VIII, fig. 38.
	?1963.	*Stephanoceras (Cadomites) deslongchampsi* (DEFRANCE) — AZARIAN, p. 196, pl. XIII, figs. 1—2.
	1964.	*Cadomites daubenyi* (GEMMELLARO) — WENDT, p. 130, pl. 21, fig. 1.
	1964b.	*Cadomites daubenyi* (GEMMELLARO) — STURANI, p. 23, text-fig. 17, pl. III, fig. 5.
	1966.	*Cadomites daubenyi* (GEMMELLARO) — STURANI, p. 29, pl. 6, fig. 2.
	1970.	*Cadomites daubenyi* (GEMM.) — GALÁCZ, p. 124.
	1972.	*Cadomites daubenyi* (GEMMELLARO) — KRYSTYN, p. 253, pl. 6, fig. 6.

M a t e r i a l : 15 relatively well-preserved internal moulds.

D i m e n s i o n s :

J9337:	80;	29 (36);	33 (41);	28 (35)
J9343:	74;	27.5 (37);	?32 (?43);	29 (39)
J9335:	70;	24 (34);	28 (40);	25 (36)
J9340:	67;	27.5 (41);	34 (51);	25 (36)
J9345:	52;	21.5 (41.5);	29 (56);	18 (35)

D e s c r i p t i o n : Medium-sized species with a moderately narrow umbilicus and a depressed-oval whorl-section. The ornamentation consists of slightly curved primary ribs with tubercules below the middle of the flanks. From the tubercules arise 3 to 4 secondary ribs, and intercalatories are also present. On the last half whorl of the figured specimen the number of the primary ribs is 18, and that of the secondaries is 64. In another, entire specimen (max. diameter 95 mm) the last whorl bears 43 primaries. The body-chamber is slightly contracted, with somewhat different ribbing, i.e. the secondaries are more widely spaced and coarser near the aperture. The body-chamber of this latter entire specimen begins at 62 mm diameter, and its length is 2/3 whorl. The pre-apertural constriction is wide and deep.

The suture-line (Text-fig. 56) is well-divided, but in comparison to those of the other congeneric forms, is simpler.

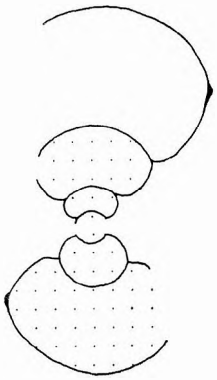
R e m a r k s : This form of common record was described by GEMMELLARO [1877, p. 67, pl. IV, figs. 3 (lectotype)-5, pl. IVbis, fig. 1], from Sicily. On the basis of its depressed-oval, non-coronate whorl-section, relatively narrow umbilicus and coarser and rarer secondary ribs on the body-chamber, this form clearly differs from the other *Cadomites* species. In spite of this fact, the forms cited in the previous literature can be separated into four, morphologically and stratigraphically distinct groups (cf. GALÁCZ 1970, p. 124). These groups are as follows:

Cadomites daubenyi (GEMMELLARO) from the Upper Bajocian to Lower Bathonian (see the synonymy presented here),

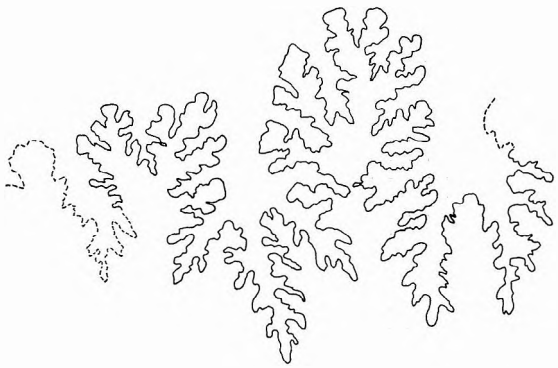
Cadomites daubenyi (BUCKMAN non GEMMELLARO) = *Cadomites sturanii* n. sp. from the Parkinsoni Zone (see below),

Cadomites daubenyi (Boehm non Gemmellaro) = *Cadomites bremeri* Tsereteli 1968, p. 80, from the upper part of the Middle Bathonian,
Cadomites daubenyi (Lissajous non Gemmellaro); non *C. lissajousi* Roché; from the lower part of the Upper Bathonian.

The differences and the stratigraphic ranges of the two latter forms were previously recorded by several French authors (Gabilly 1964, Mangold et al. 1967, Elmi 1967, Elmi et al. 1971). In some works (e.g. Wendt 1964, Sturani 1964b, Torrens 1967) *Cadomites orbignyi* de Grossouvre



Text-fig. 55. Whorl-section of *Cadomites (C.) daubenyi* (J9334), I, Parkinsoni Z.



Text-fig. 56. Suture-line of *Cadomites (C.) daubenyi* (J9341), VI/13, Parkinsoni Z.

is regarded as synonym of *C. daubenyi* (Gemmellaro), however, the two forms can be separated both morphologically and stratigraphically.

Distribution: The type was described by Gemmellaro from the Bathonian of Sicily. On the basis of the literature this mainly Mediterranean form occurs in the Upper Bajocian and Lower Bathonian. At Gyenespuszta the specimens were collected from the Subfurcatum, Garantiana and Parkinsoni Zones (Beds 17 to 13) of Profile VI and from Profile I.

Cadomites (Cadomites) sturanii n. sp.

Pl. XV, figs. 2—3, Text-figs. 57, 58

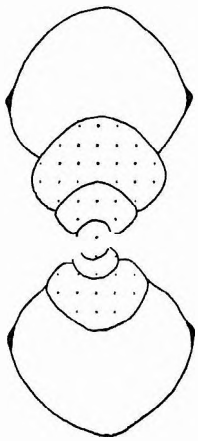
1922. *Polystephanus daubenyi* Gemmellaro sp. — Buckman (1909—30), pl. 311.
?1937. *Polystephanus daubenyi* Buckman (1910), 1922 — Wetzel, p. 81, text-fig. 1.
1939. *Cadomites Daubenyi* Gemmellaro sp. — Roché, p. 203, pl. I, fig. 3.
1964a. *Cadomites* n. sp. aff. *rectelobatus* (Hauer) [= *Polystephanus daubenyi* S. Buckm. (non Gemm.)] — Sturani, p. 41.
1970. *Cadomites daubenyi* (Buckman non Gemm.) — Galácz, pp. 119, 124.

Holotype: Pl. XV, fig. 2; J9329.
Locus typicus: Gyenespuszta, northern Bakony, Transdanubian Central Mountains, Profile VI.
Stratum typicum: ammonitico rosso limestone with *Parkinsonia parkinsoni* (Upper Bajocian Parkinsoni Zone, Bed 15).
Derivatio nominis: In tribute to the late Professor C. Sturani, who was first to separate this form.
Diagnosis: Larger *Cadomites* with a narrow umbilicus, high-oval, subtriangular whorl-section and a row of tubercules at the lower third of the flanks.
Material: Beside the holotype, 7 relatively well-preserved specimens.

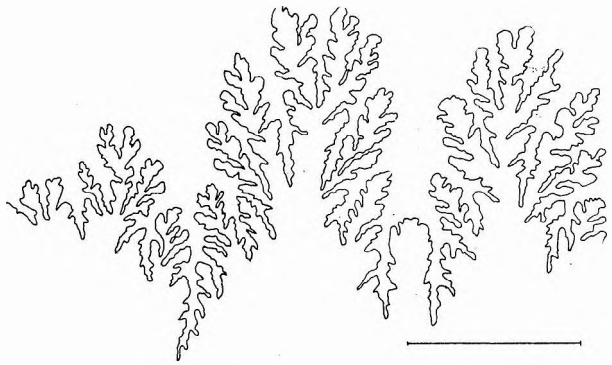
Dimensions:				
	J9327: 77;	34 (44);	?39 (?51);	26 (54)
	J9330: 73;	29 (40);	34 (46.5);	23 (31.5)
Holotype,	J9329: 68;	28 (41);	38 (56);	20 (29.5)
	J9331: 67;	29 (43);	30 (45);	20 (30)
	J9328: 53;	25 (47);	33 (62);	17 (32)
	J9332: 46;	23 (50);	28 (61);	11 (24)

Description: The holotype is a fragmentary specimen of medium-size lacking the second half of the last whorl (body-chamber). The umbilicus is narrow and deep. The shape of the whorl-section (Text-fig. 57) is high-oval, subtriangular, the greatest width can be measured at the lower third of the flanks. In the internal mould the primary ribs are blunter, ending in tubercules elongated

somewhat radially at the lower third of the whorl-sides. From the tubercules secondary ribs issue in bundles. A primary rib corresponds to 3 to 4 secondaries on the venter, and additional intercalatories are also present. On the last quarter whorl of the holotype the number of the primary ribs is 13, and that of the secondaries is 63. On the holotype the phragmocone ends at 52 mm diameter, its length is half a whorl. On a larger paratype (No. J9327) the entire body-chamber begins at about 57 mm diameter and its length is 2/3 of a whorl. On the same specimen the body-chamber is seemingly contracted and its ribbing tends to coarsen. The aperture cannot be studied on the specimens, but on the largest paratype mentioned above the pre-apertural constriction is partly visible.



Text-fig. 57. Whorl-section of *Cadomites (C.) sturanii* n. sp. (J9330), I, Parkinsoni Z.



Text-fig. 58. Suture-line of *Cadomites (C.) sturanii* n. sp. (J9330), I, Parkinsoni Z.

The suture-line is built up of slender and deep lobes (Text-fig. 58). L is extremely deep, and similarly to that on the specimen of BUCKMAN (1909—1930, pl. 311, fig. 1a), it is slightly curved umbilically. ES is extremely high and incised by long, slender accessories.

R e m a r k s : The form figured first by BUCKMAN (loc. cit.) under the name *Polystephanus daubenyi* GEMMELLARO differs from the type of *C. daubenyi* (GEMM.) by its narrower umbilicus, greater whorl-width, different whorl-section and shorter primary ribs. These differences were recognized earlier, and STURANI (1964a, p. 41) separated his "*C. daubenyi* BUCKM. non GEMM." specimen as a new species. However, later in his monograph (1964b) he placed these forms into *C. rectelobatus* (HAUER).

D i s t r i b u t i o n : The specimen of BUCKMAN came from the Truellei Bed of Southern England; i.e. from the lower part of the Parkinsoni Zone (cf. TORRENS 1969). From France this form is also recorded from the Parkinsoni Zone (ROCHÉ 1939). STURANI (1964a) mentioned it from the Parkinsoni Zone of the Southern Alps, together with *Strigoceras* and *Vermisphinctes*, forms suggesting the lower part of the zone.

The Gyenespuszta specimens came also from the Parkinsoni Zone. The specimens, which were collected from the well-subdivided Profile VI are confined to Bed 15, i.e. to the lower Parkinsoni Zone. On the basis of these data, this species is equally recorded from Mediterranean and NW European areas, and characterizes the lower part of the Parkinsoni Zone.

Cadomites (Cadomites) orbignyi DE GROSSOUVRE, 1930

Pl. XV, fig. 4

1846. *Ammonites linguiferus* D'ORBIGNY — D'ORBIGNY (1842—51), p. 402, pl. 136, figs. 1—2 (only).
1930. *Cadomites Orbigny* n. sp. — DE GROSSOUVRE, p. 373, pl. XXXIX, fig. 6.
1935. *Cadomites rectelobatum* HAUER — PASSENDORFER, p. 18, pl. III, figs. 6a-b (only).
1937. *Cadomites orbignyi* n. nom. — WETZEL, p. 80.
non 1938. *Cadomites* aff. *orbignyi* WETZEL (= *linguiferus* ORB. s.p.) — SCHMIDTILL—KRUMBECK, p. 344, pl. 10, fig. 3, pl. 14, fig. 4.
non 1963. *Cadomites orbignyi* DE GROSSOUVRE — STEPHANOV, p. 176, pl. II, fig. 3.

non 1968. *Cadomites orbignyi* DE GROSSOUVRE — TSERETELI, p. 75, pl. IX, figs. 1a-b.
1970. *Cadomites* sp. — GALÁCZ, p. 119.

Material: A single, fragmentary specimen.
Dimensions: J9333: 62; 23 (37); ?28 (?45); 22 (35.5)

Description: Relatively small form with a moderately wide umbilicus. The whorl-section on the inner and outer whorls is uncoronate, rounded, the venter is highly arched. The ornamentation consists of numerous primary ribs and fine, dense secondaries. The primaries terminate in tiny, acute tubercules. Because of subsolution, the inner whorls are hardly visible, but tubercules can be detected even here. On the last whorl the number of the primary ribs is 29, but that of the secondaries cannot be counted; it is about 4 to 5 in each primary. The body-chamber begins at about 45 mm diameter, its length on this fragmentary specimen is more than half a whorl. The suture-line cannot be seen.

Remarks: *C. orbignyi* differs from the other congeneric species primarily by its smaller size. The similarly small *C. exstinctus* (see below) has a coronate whorl-section in its younger stages and a more widely spaced primary ribbing. *C. daubenyi* (GEMMELLARO) is bigger, and has wider whorls and coarser ribbing on the body-chamber. According to ARKELL (1951—59, p. 81), *C. orbignyi* is characterized by non-tuberculate inner whorls ("subtuberculation", see in KOPIK 1974, p. 26). WENDT (1964, p. 132) pointed out, that this feature could merely be due to the stronger corrosion of the inner whorls of GEMMELLARO's type specimen. The first to draw the attention to the two different forms figured by D'ORBIGNY (1842—51) on his pl. 136 under the name "*Ammonites linguiferus*" was DE GROSSOUVRE in 1919. He recognized that the true *linguiferus* corresponds excusively to the smaller specimen figured on figs. 4—5, and that figs. 1—2 are tentative restorations of a bigger, specifically different form. Later, in 1930, he refigured this latter specimen under the new name *Cadomites orbignyi*. His figure (pl. XXXIX, fig. 6) was later designated as lectotype by ARKELL (loc. cit.).

The inequality of the two ammonites figured by D'ORBIGNY on his pl. 136 was recognized also by WETZEL (1937, p. 80), and independently of DE GROSSOUVRE's procedure published in 1930, he renamed the bigger example as *Cadomites orbignyi* n. nom.

The *Cadomites* figured by PASSENDORFER (1935, pl. III, fig. 6) as *C. rectelobatum* HAUER certainly belongs to DE GROSSOUVRE's species, because it is of similar size, coiling, whorl-section and ribbing. SCHMIDTILL and KRUMBECK (1938, pl. 10, fig. 3, pl. 14, fig. 4) figured a Middle Bajocian form under this name, which is, on the basis of the ribbing and the suture-line, a *Stephanoceras* specimen. The Bulgarian form figured by STEPHANOV (1963, pl. II, fig. 3) shows bigger size and different ribbing, and can be rather assigned to the species *C. rectelobatus* (HAUER). Both WENDT (1964, p. 132) and STURANI (1964a, p. 24; 1966, p. 29) considered *C. orbignyi* as a synonym of *Cadomites daubenyi* (GEMMELLARO). Under the name *C. orbignyi*, TSERETELI figured a body-chamber fragment (1968, pl. IX, figs. 1a-b), with a widely arched venter, which cannot be placed into this species, owing to its different size, dimensions and nontuberculate ribs.

Distribution: The type came from the Middle Bathonian of Luçon (Vendée, France). According to GABILLY (1964, p. 71), in the type-area it is a characteristic element in the basal Middle Bathonian. A Middle Bathonian age was recorded also by MANGOLD et al. (1967, pp. 107, 110), but Lower Bathonian finds were mentioned (MANGOLD et al. 1964, p. 530), too. The specimen described here is the first record from the Mediterranean area. It has been sampled from the Upper Bajocian (Bed 15, Parkinsoni Zone of Profile VI).

Cadomites (Cadomites) rectelobatus (HAUER, 1857)

Pl. XVI, figs. 1—2, Text-figs. 59, 60

1852. *Ammonites Humphriesianus* SOW. var. — KUDERNATSCH, p. 13, pl. III, figs. 5—6.
1857. *Ammonites rectelobatus* HAUER — HAUER, p. 14, pl. I, fig. 5, pl. II, fig. 10.
non 1892. *Stephanoceras rectelobatum* HAU. — NEUMAYR—UHLIG, p. 50, pl. V, fig. 5, pl. VI, fig. 2.
1905. *Stephanoceras rectelobatum* HAUER — SIMIONESCU, p. 20, pl. II, fig. 6.
non 1905. *Stephanoceras rectelobatum* HAUER — POPOVICI-HATZEG, p. 20, pl. VI, figs. 5, 10.
1925. *Coeloceras (Stephanoceras) Arbenzi* nov. spec. — THALMANN, p. 205, text-figs. 1—2.
non 1929. *Cadomites rectelobatus* HAUER — LANQUINE, p. 317, pl. XII, fig. 3.
1930. *Cadomites rectelobatus* HAUER — ROMAN, p. 21, pl. VII, fig. 6.
non 1934. *Cadomites rectelobatus* v. HAUER — BIGOT, p. 711, pl. XLI, figs. 3, 3a-b.
1935. *Cadomites rectelobatum* HAUER — PASSENDORFER, p. 17, pl. IV, fig. 9 (only).
1960. *Stephanoceras rectelobatum* HAUER — RAILEANU—PELIN, p. 49, pl. II, fig. 1.
1963. *Cadomites orbignyi* DE GROSSOUVRE — STEPHANOV, p. 176, pl. II, fig. 3.
1964b. *Cadomites rectelobatus* (HAUER) — STURANI, p. 22, text-figs. 19A-B, pl. II, figs. 6, 8.
1966. *Cadomites rectelobatus* (HAUER) sensu STURANI — STURANI, p. 29, pl. 6, figs. 3a-b, pl. 13, figs. 1a-b.
non 1968. *Cadomites rectelobatus* (HAUER) — TSERETELI, p. 77, pl. IX, figs. 2a-b.
1969. *Cadomites rectelobatus* (HAUER) — MIHAJLOVIČ, p. 65, pl. IV, figs. 5, 5a.

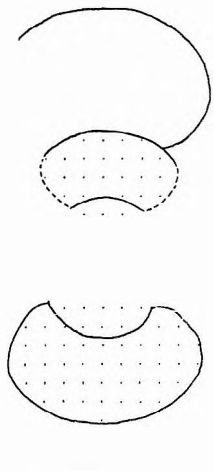
1970. *Cadomites rectelobatus* (HAUER) — GALÁCZ, pp. 120—121.
1971. *Cadomites (Cadomites) rectelobatus* (v. HAUER) — HAHN, p. 112, pl. 9, fig. 9.
?1972. *Cadomites rectelobatus* (HAUER) — KRYSTYN, p. 251, pl. 18, fig. 1, text-fig. 18.
1974. *Cadomites (Cadomites) rectelobatus* (HAUER, 1857) — KOPIK, p. 19, pl. III, figs. 1—2.

Material: 14 well-identifiable and several fragmentary specimens.

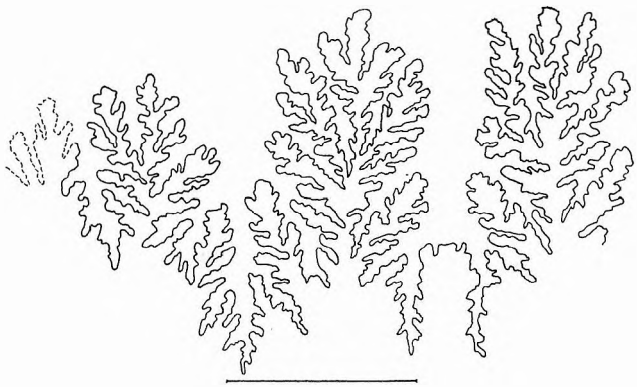
Dimensions:

J9347:	106;	42 (39.5);	?54 (?52);	41 (38.5)
J9348:	94;	34 (36);	?51 (?54);	35 (37)
J9346:	91;	35 (38.5);	?44 (?48);	32 (35)
J9351:	77;	28 (36);	?34 (?52);	27 (35)
J9350:	51;	19 (37);	28 (59);	18 (35)
J9352:	49;	23 (47);	?38 (?78);	15 (30.5)
J9349:	37;	16 (43);	23 (62);	12 (32)

Description: The figured bigger specimen is a well-preserved internal cast. The umbilicus is moderately narrow and deep. The whorl-section (Text-fig. 59) is depressed, the internal whorls are coronate, the body-chamber is wide-oval, with a strongly arched venter. The ornamentation consists of slightly prorsiradiate primary ribs, fine, lamellar secondaries and sharp tubercules at the furcation points. Usually 4 to 5 secondaries correspond to a primary rib on the venter and some intercalatories also appear. The primary ribs number 44 to 46 on the last whorl. The length of the slightly contracted body-chamber beginning at about 65 mm diameter is 2/3 of a whorl, showing no change in the ribbing.



Text-fig. 59. Whorl-section of *Cadomites (C.) rectelobatus* (J9348), VI/2, Middle Bathonian



Text-fig. 60. Suture-line of *Cadomites (C.) rectelobatus* (J9353) I, Parkinsoni Z.

The aperture is simple, with a wide terminal constriction and a flared collar. At the beginning of another specimen's body-chamber (No. J9348) a slight, narrow constriction is visible at a diameter of 70 mm.

The suture-line (Text-fig. 60) is highly complex, with high saddles and slender lobes.

Remarks: From the other *Cadomites* species of similar size, *Cadomites rectelobatus* (HAUER) differs by its more coronate inner whorls, and the more depressed venter on the chambered whorls. The pattern of the whorl-section can be well recognized on the drawing of the holotype figured by KRYSTYN (1972, p. 252, text-fig. 18a). On the similarly large *C. deslongchampsi* (D'ORBIGNY) the body-chamber is depressed, with a trapezoidal whorl-section. On the other hand, the inner whorls of the species *C. daubenyi* (GEMMELLARO) show an oval, uncoronate section and its secondary ribs on the body-chamber are coarser.

Despite its distinct morphological features, *C. rectelobatus* is interpreted more widely in the literature. In the synonymy given by STURANI (1964b) extremely depressed forms [e.g. *C. arbenzi* (THALMANN)], as well as highly arched examples [e.g. *C. daubenyi* (BUCKMAN non GEMMELLARO)] are included. He also assigned *C. exstinctus* (QUENSTEDT) to this species.

With its whorl-section *C. rectelobatus* is an intermediate form between the moderately arched *C. daubenyi* (GEMMELLARO) and the trapezoidal *C. deslongchampsi* (D'ORBIGNY). In this respect, it is reasonable to interpret *C. arbenzi* (THALMANN) as a synonym of *C. rectelobatus*. On the basis of studies on some topotypes from Swinitza in the collections of the Hungarian Geological Institute, the type seems to be nearer to the strongly depressed, wide *C. arbenzi* than to the narrowly arched form interpreted commonly in the literature.

The specimens from the Caucasus figured by NEUMAYR and UHLIG (1892, pl. V, fig. 5, pl. VI, fig. 2) belong most probably to some Bajocian *Stephanoceras* s.s. species (see ARKELL 1956, p. 361). The small "*Cadomites*" specimens, which were figured by POPOVICI-HATZEG (1905, pl. VI, figs. 5, 10), LANQUINE (1929, pl. XII, fig. 3) and BIGOT (1934, pl. XLI, fig. 3) seem to be a distinct, undescribed species. PASSENDORFER (1935) figured four different species under the name *C. rectelobatum*. The nucleus on pl. II, fig. 7 is near to *C. rectelobatus*. The specimen figured on pl. III, figs. 6a-b clearly belongs to *C. orbigny* DE GROSSOUVRE, and pl. IV, figs. 1a-b seem to represent a *Polyplectites* specimen. The single specimen, which certainly belongs to *C. rectelobatus* is that figured on pl. IV, fig. 9. On the basis of the size and ribbing, the form described and figured from the Bulgarian Bathonian by STEPHANOV (1963, p. 176, pl. II, fig. 3) is certainly a representative of *C. rectelobatus*.

TSERETELI (1968, p. 77, pl. IX, fig. 2) described and figured a specimen under this name from the Bathonian of the Caucasus, but it is most probably a *Polyplectites*, close to *P. dorni* (ROCHÉ). KRYSTYN (1972, pl. 18, fig. 1, text-fig. 18b) figured a specimen, which with its size and whorl-section resembles the type. On the other hand, the primaries are more widely spaced and the secondaries are coarser on the body-chamber, hence the identity is questionable.

Distribution: The type of this species commonly recorded from Mediterranean localities came from the condensed, mainly Lower Bathonian Swinitza fauna. Outside the Mediterranean region the species is more scant, but a very good specimen was figured by HAHN (1971) from the Swabian Lower Bathonian. The stratigraphic range extends from the Upper Bajocian (Parkinsoni Zone) up to the Upper Bathonian.

At Gyenespuszta all the profiles yielded *C. rectelobatus* specimens, from beds of the Parkinsoni Zone to the Upper Bathonian.

Cadomites (Cadomites) exstinctus (QUENSTEDT, 1887)

Pl. XVI, fig. 4

	1887.	*Ammonites anceps exstinctus* — QUENSTEDT (1886—87), p. 630, pl. 74, figs. 30, 32—34 (only).
	1911.	*Coeloceras (Stephanoc.) extinctum* sp. nov. — ROLLIER, p. 301.
non	1915.	*Stephanoceras extinctum* (QUENST.) ROLLIER — LÓCZY, p. 94, pl. IV, fig. 10.
	?1952.	*Cadomites* cf. *deslongchampsi* (D'ORBIGNY) — ARKELL (1951—59), p. 80, pl. IX, fig. 3.
	1953.	*Polyplectites* ex gr. *extinctus* (QU.) — SCHINDEWOLF, p. 126, text-fig. 9.
non	1961.	*Stephanoceras extinctum* ROLLIER — HIMSHIASHVILI, p. 161, pl. I, fig. 5.
non	1966.	*Cadomites* n. sp. aff. *extinctus* (ROLLIER, 1911 pro QUENSTEDT, 1886) — BREMER, p. 164, pl. 18, figs. 1a-b, 2.
	1971.	*Cadomites (Cadomites) exstinctus* (QUENSTEDT) — HAHN, p. 110, pl. 9, figs. 10—13.
non	1972.	*Cadomites (C.) extinctus* (QUENSTEDT) — PAVIA, p. 102, pl. 16, figs. 2, 3, 8, pl. 17, fig. 5.

Material: A single, poorly preserved internal mould.
Dimensions: J9336: 66; 23 (35); 30 (45.5); 24 (36)

Description: A relatively small form, with a moderately narrow umbilicus. The internal whorls are heavily depressed, coronate, the venter on the last whorl is more arched, the body-chamber is contracted. The ribbing consists of prorsiradiate primary and fine secondary ribs with small, acute tubercules at the bifurcation points. Because of the poor state of preservation the primary/secondary ratio cannot be counted, but a primary rib apparently corresponds to four secondaries on the body-chamber. The aperture is hardly visible, the peristome is projected ventrally with a smooth, flat collar and a wide, shallow constriction behind. The suture-line cannot be studied.

Remarks: *C. exstinctus* differs from the other congeneric forms first of all by its small size, heavily contracted body-chamber and fine secondary ribs. The similarly small *C. orbignyi* DE GROSSOUVRE bears more numerous primaries. Since the studies of HAHN (1971) on the original material, it has been known, that the lectotype (QUENSTEDT 1886—87, pl. 74, fig. 30) is a slightly deformed specimen, and its original figure is one of the few, somewhat idealized drawings of QUENSTEDT. The erroneous citation of this species, common as it is in the literature may be due partly to this fact.

Beside the lectotype designated by ROLLIER (1911, p. 301), QUENSTEDT figured some other specimens. Those three on figs. 32—34 are regarded by HAHN (1971, p. 110) as conspecific, and the nucleus on QUENSTEDT's pl. 74, fig. 35 is referred to as *Cadomites (Polyplectites)* sp. (loc. cit. p. 114). On the other hand, this latter figure was previously designated by WETZEL (1937, p. 82) as the type of his *C. (Polyplectites) eningensis*. A somewhat similar form was recently described as *C. (P.) claromontanus* from the Polish Upper Bathonian by KOPIK (1974, p. 39, pl. XI, figs. 2a-c).

The original of LÓCZY's figure (1915, p. 313, pl. IV, fig. 10) is undoubtedly a *Polyplectites* (cf. AGER and CALLOMON 1971, p. 6) as, at its small size, the last whorl is slightly uncoiled, and as the ribbing of the hardly visible terminal part of the last whorl is somewhat denser, indicating the closeness of the aperture. It is near to the "*Cadomites linqiferus* (D'ORBIGNY)" figured by ROMAN (1936, pl. II, figs. 3, 3a). Both the preservation (i.e. it is a shelled specimen) and the matrix (red limestone)

suggest that this specimen could not come from the Villány Lower Callovian locality (see Géczy 1971, p. 467).

The English Lower Bathonian specimen (Arkell 1951—59, pl. IX, fig. 3) is only a whorl-fragment, thus in lack of the body-chamber and aperture the inclusion here is uncertain.

Under the name *Stephanoceras extinctum* Rollier, a small ammonite from the Georgian Callovian was described and figured by Himshiashvili (1961). On the basis of the size and the well-visible lateral lappet, this form cannot be assigned to the genus *Cadomites*. Lately Paitschadze (1973, p. 41) classed this form as a synonym of his *C. (Polyplectites) ertsonensis* species. The *Cadomites* specimen figured by Bremer (1966, pl. 18, figs. 1a-b, 2) (not identical with *Cadomites bremeri* Tsereteli, 1968) differs by its bigger size, greater number of primaries and fewer secondaries. The Upper Bajocian form described by Pavia (1972) from SE France has uncoronate, rounded inner whorls and coarser ribbing on the body-chamber.

Distribution: The type came from the Lower Bathonian Macrescens Subzone of Eningen, Swabia (Hahn 1971), i.e. from a locality of the NW European faunal realm. The other specimens of Hahn also derive from SW German Lower Bathonian. The species was recently recorded also from the Lower Bathonian of France and Portugal (Gabilly 1964, p. 72: Zigzag Zone; Mangold et al. 1967, pp. 109, 110: Zigzag Zone; Elmi et al. 1971, p. 442: Convergens Subzone). In earlier literature—after Lóczy (1915) or so—this species was frequently recorded from the Lower Callovian (e.g. Krymholz 1962, p. 756), but these records were based on non-figured specimens and thus, uncertain finds.

The Gyenespuszta specimen is the first representative of this species from the Mediterranean faunal realm. It was recovered from Bed 4, i.e. from the Middle Bathonian Subcontractus Zone of Profile VI.

Subgenus CADOMITES (POLYPLECTITES) Mascke, 1907

Type species, by original designation, is *Am. linguiferus* d'Orbigny (1842—51, p. 402, pl. 136) from the Middle Bathonian of Luçon (W France). The lectotype (d'Orbigny, loc. cit. figs. 4—5) was designated by de Grossouvre (1930, p. 373). According to Westermann (1954, p. 338) the originals of the smaller figures of d'Orbigny's pl. 136 are lost, therefore he designated a neotype. It is a topotype figured first by de Grossouvre (1930, pl. 40, fig. 10), and then refigured by Arkell (1951—57, text-fig. 21, right).

General remarks: According to Westermann (1954, p. 340), the neotype came from the Upper Bathonian Clydoniceras discus Zone of Luçon (Vendée, France). However, in this area (southern marginal zone of Vendée) the upper part of the Upper Bathonian is missing (see Gabilly 1964, p. 87, Mangold et al. 1967, p. 105), therefore the original age determination of de Grossouvre (i.e. Middle Bathonian) seems to be more likely.

The representatives of *Polyplectites*, together with *Cadomites*, can be originated from the last *Stephanoceras*, namely the microconch *Normannites* s.l. Nevertheless, a direct connection, similar to that between *Stephanoceras* s.s. and *Cadomites* s.s. could not be demonstrated so far. The most probable ancestors of *Polyplectites* should be traced among the non-coronate, densely-ribbed *Normannites*, a group roughly corresponding to *Germanites* Westermann 1956, of the Humphriesianum Zone.

Distribution: The earliest representatives of the subgenus *Polyplectites* appear in the basal Subfurcatum Zone (Pavia 1972, p. 103). However, species are expected to be recorded in the future from the upper part of the Humphriesianum Zone, as the macroconch counterpart of *Cadomites* is known from these horizons. In the Upper Bajocian and Lower and Middle Bathonian the subgenus is represented by several species, but its Upper Bathonian range is uncertain.

Similarly to the case of *Cadomites* s.s., *Polyplectites* is generally known from Mediterranean localities, with some rather sporadic NW European finds. Its representatives are usually rare elements in the faunas, as compared to the common *Cadomites* occurrences.

Dimorphism: (see in *Cadomites* above).

Cadomites (Polyplectites) richei Lissajous, 1923

Pl. XVI, fig. 3

1923. *Polyplectites Richei* Lissajous — Lissajous, p. 106, pl. XXIII, fig. 2, text-fig. 22.
1930. *Cadomites contrarius* n. sp. — de Grossouvre, p. 374, pl. XL, fig. 6.
?1930. *Polyplectites richei* Lissajous — Roman, p. 35, pl. VII, fig. 4.
?1956. *Cadomites* cf. *contrarius* Gross. — Sachariewa-Kowatschewa, p. 256, pl. XIV, fig. 6.
1970. *Polyplectites* sp. — Galácz, p. 118.

Material: Two internal moulds of satisfactory preservation.
Dimensions: J9354: 32; 12 (37.5); 11.5 (36); 14.5 (45.5)

Description: Small lappetted form with a relatively wide umbilicus. Whorls somewhat depressed. The maximal width can be measured at the middle of the flanks. The ornamentation consists of sharp ribbing, with prorsiradiate, slightly curved primaries and radial secondaries. This pattern has resulted in a knee-like break in appearance. The primary ribs bifurcate at the middle of the whorl-sides, where tiny, sharp tubercules appear. The number of the primaries on the last half whorl is 19, and the number of the secondaries is 33. The end of the phragmocone is hardly visible; the estimated length of the body-chamber is about a half-whorl. The ribbing of the body-chamber is somewhat different over the last 1/4, i.e. the secondary ribs are also prorsiradiate here. The short lateral lapets are visible. The suture-line cannot be deciphered.

Remarks: On the basis of its ribbing and dimensions the specimen agrees well with the type figured by LISSAJOUS (1923, pl. XXIII, fig. 2). The type, judging by the change in its ribbing, is an almost complete specimen, only the lappetted aperture is absent. The specimen described and figured by DE GROSSOUVRE (1930, p. 374, pl. XL, fig. 6) as *Cadomites contrarius* n. sp. seems to represent the inner whorls of this species. The specific name was given to refer to the ribbing, which is similar to that of *Epistrenoceras contrarius* (D'ORBIGNY), and this pattern is really characteristic of the inner whorls of LISSAJOUS's species. The specimen figured by ROMAN (1930) is a fragmentary example, but on the basis of the similarity in the ornamentation, this is probably an other representative of this species.

Distribution: Beside of French and Portugese occurrences (ELMI et al. 1971, p. 445) from the NW European area, this species was recorded from the Mediterranean region, from N Africa, too (ROMAN 1930). At the type locality (Macon) the precise age of the type within the Bathonian is uncertain, but the Middle Bathonian age is probable. "*C. contrarius*" was similarly recorded from the Middle Bathonian. The age of the Maroccan specimen was recognized also as Middle Bathonian by ARKELL (1956, p. 277). The Portugese specimen came from the lower part of the Upper Bathonian (ELMI et al. 1971, p. 445).

The figured and described Gyenespuszta specimen was collected from the rubble of the excavation of Profile VI, therefore the exact horizon is unknown. By the features of the matrix the presence of the lower Middle Bathonian is probable. The other, poorly preserved specimen has come from Bed 17 (Subfurcatum Zone).

Cadomites (Polyplectites) venetus (PARONA, 1896)

Pl. XV, fig. 6, Text-fig. 61

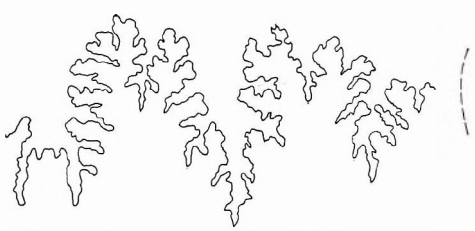
1896. *Stephanoceras venetum* n.f. — PARONA, p. 18, pl. I, figs. 21, 21a.
non 1964a. *Polyplectites ? venetus* (PARONA) — WENDT, p. 132, pl. 21, figs. 2a-b, pl. 24, fig. 5.
1964a. *Otoites delicatus* (S. BUCKMAN) — STURANI, p. 31, pl. IV, fig. 12.
1970. *Polyplectites* sp. — GALÁCZ, p. 119.
1971. *Polyplectites (?) venetus* (PARONA) — STURANI, p. 135, pl. 13, figs. 2—3.
non 1972. *Polyplectites venetus* (PARONA) — KRYSTYN, p. 255, pl. 6, fig. 8.

Material: A single internal cast of moderate preservation.
Dimensions: J9356: 41; 17.5 (43); 21 (51); 14 (34)

Description: Small form with a relatively wide umbilicus. The whorl-section is depressed oval, without any distinct umbilical and outer edges. The ornamentation consists of stronger primary ribs with tubercules on the middle of the flanks and finer secondaries starting from the tubercules. On the last preserved half whorl the number of the primary ribs is 15, the corresponding secondaries number 38 on the venter. Over the chambered part of the last whorl the primaries mainly trifurcate, while bifurcation appears rather on the body-chamber. The tubercules situating at medium whorl-height are rounded on the internal mould. At the end of the phragmocone a slight constriction is visible, and after this constriction the body-chamber coils somewhat excentrically. The end of the body-chamber, together with the aperture, is missing.

The suture-line (Text-fig. 61) is simple, with wide saddles and narrow lobes.

Remarks: The generic arrangement of this species is somewhat uncertain, because specimens with a preserved aperture have been hitherto unknown. STURANI (1971, p. 135) in the new description of the holotype mentioned the visible trace of the lateral lappets, but its presence is unprob-



Text-fig. 61. Suture-line of *Cadomites (Polyplectites) venetus* (J9356), VI/13, Parkinsoni Z.

able on the basis of the figure (pl. 13, fig. 3), which shows only a 1/3 whorl body-chamber. However, the small size, the slender coiling, the narrow whorls and the slight uncoiling of the body-chambers on both the holotype and the Gyenespuszta specimen suggest that this species belongs into the microconchiate subgenus *Polyplectites*.

The previous misidentifications (WENDT 1964, KRYSTYN 1972) can be due to the misleading figures of PARONA. On the basis of the new holotype figures of STURANI, neither the Sicilian, nor the Austrian specimens agree with *P. venetus*, but rather belong to a distinct (new?) species. *Stephanoceras* ? nov. sp. of GEMMELLARO (1872, pl. IV, figs. 2, 2a), which also assigned, by WENDT, to this species, is similarly different. This ammonite seems to be conspecific with the two above forms.

P. venetus differs from other congeneric species with its polygonal coiling (see STURANI 1971, p. 136), with its relatively wide umbilicus and slender whorls.

Distribution: The type of the species came from northern Italy, i.e. from a Mediterranean locality, from the Subfurcatum Zone. Similar is the age of other specimens which were described by STURANI from other localities. At Gyenespuszta the described specimen was collected from Bed 13, i.e. from the Parkinsoni Zone of Profile VI.

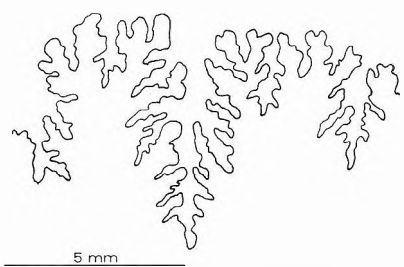
Cadomites (Polyplectites) zlatarskii STEPHANOV, 1963

Pl. XVI, fig. 6, Text-fig. 62

1963. *Cadomites zlatarskii* sp. nov. — STEPHANOV, p. 177, pl. I, figs. 2a-b.
non 1968. *Cadomites zlatarskii* STEPHANOV — TSERETELI, p. 78, pl. IX, figs. 3—4, pl. X, figs. 1—3, pl. XI, figs. 1—3.
1968. *Polyplectites denseplicatus* LISSAJOUS — TSERETELI, p. 83, pl. XI, figs. 2—3.
1970. *Polyplectites zlatarskii* (STEPHANOV) — GALÁCZ, p. 120.

Material: A single internal mould of good preservation.
Dimensions: J9357: 39; 15.5 (40); 20 (51); 14 (38)

Description: Small, microconchiate form. Umbilicus moderately narrow and deep. Umbilical wall and flank evenly rounded into each other. The flanks are rather reduced and rounded into the wide, low, ventral side. The whorl-section is wide-oval, the greatest thickness can be measured at medium whorl-height. The ribbing consists of sharp primaries starting from the umbilical wall and inclining slightly forwards, and fine secondaries starting from tiny, sharp tubercules at the middle of the flank. The last whorl bears 38 primary ribs, and on the venter usually 4 secondary ribs correspond to each primary. The phragmocone ends at about 25 mm diameter, the length of the body-chamber is 3/5 of a whorl. The terminal part of the body-chamber is somewhat uncoiled. The aperture is partly damaged, but the two lateral lappets are quite distinct.



Text-fig. 62. Suture-line of *Cadomites (Polyplectites) zlatarskii* (J9357), VI/12, Zigzag Z.

The suture-line (Text-fig. 62) is relatively simple, with the characteristic elements of this subgenus.

Remarks: STEPHANOV (1963, p. 177) presented a relatively precise description of this species. On his specimen, however, the lappetted aperture was missing, and in spite of the recognition of the terminal uncoiling of the last (body) whorl, he regarded this form as a *Cadomites* species. The Gyenespuszta specimen agrees well with the type figures in all characters and on the basis of the preserved auriculate peristome, this species can be assigned to the subgenus *Polyplectites*. Some specimens of this species were recorded and figured by TSERETELI (1968, pl. XI, figs. 2—3) as *P. denseplicatus*. The species of LISSAJOUS (1923, p. 107, pl. XIII, fig. 3), however, is smaller (his figure is 2× enlarged!), its whorls are more slender and its primary ribs are strongly curved forwards. On the other hand, the specimens determined by TSERETELI as *Cadomites zlatarskii* (loc. cit. p. 78, pl. IX, figs. 3—4, pl. X, figs. 1—3, pl. XI, fig. 1) cannot be assigned to this species, owing to their greater size, different dimensions and coarser ribbing. These forms are closer to *C. (P.) dorni* ROCHÉ, but this latter form has a more widely spaced ribbing.

Distribution: The type was described from a locality in NW Bulgaria yielding both NW European and Mediterranean ammonites. The Georgian occurrence belongs to the Mediterranean province. These localities, and the occurrence at Gyenespuszta certainly suggest this form to be of Mediterranean character. The type specimen was described by STEPHANOV from the Middle Bathonian (Subcontractus Zone). The age of the Georgian specimens is Upper Bathonian. The Gyenespuszta specimen has come from the Zigzag Zone (Bed 12) of Profile VI.

Familia **Sphaeroceratidae** BUCKMAN, 1920

Genus SPHAEROCERAS BAYLE, 1878

Genotype: *Sphaeroceras brongniarti brongniarti* (SOWERBY 1812—29, p. 190, pl. 184. A, fig. 2). The type species was designated by DOUVILLÉ (1879, p. 91). For subspecific separation, see STURANI 1971, p. 138.

General remarks: The name *Sphaeroceras* was used in the earlier literature in an extremely wide sense, labelling practically all Middle Jurassic sphaerocone ammonites. After the works of ARKELL (1951—59, pp. 76—79), WESTERMANN (1956, pp. 24—28) and most recently STURANI (1971, pp. 136—141), it is clear, that the generic name *Sphaeroceras* should be restricted to Middle and Upper Bajocian, small, globular ammonites with an almost occluded umbilicus and contracted body-chamber terminating in a collared peristome.

ARKELL (1951—59, p. 78) regarded *Labyrinthoceras* as the ancestral form of *Sphaeroceras*. On the other hand, WESTERMANN (1964, p. 51), disregarding the lower Humphriesianum Zone occurrences of *Sphaeroceras*, originated this genus from *Chondroceras*. STURANI (1971) included *Chondroceras* in *Sphaeroceras* at subgeneric rank, and considered the Sowerbyi Zone *Frogdenites* to have been the ancestral form. This latter opinion should be regarded as justified, especially on account of known *Sphaeroceras* from horizons below the Humphriesianum Zone [e.g. *Sphaeroceras mansellii* (J. BUCKMAN), Sowerbyi Zone, cf. PARSONS 1974, p. 166]. Whether these early Bajocian "*Sphaeroceras*" species are real representatives of this genus, or microconchiate forms of known macroconch genera, e.g. *Labyrinthoceras*, however, is an open question.

Another problematic question is the later connection of this group. ARKELL (loc. cit. p. 78) regarded *Chondroceras* as the ancestor of the Bathonian sphaerocone genera. The relatively wide stratigraphic gap between these lineages, however, makes it difficult to suppose direct connections. As another, alternative hypothesis, it would be suggested that the normal, evolute stephanoceratids eradiated independent sphaerocone offshoots from time to time in the Bajocian, Bathonian and Callovian.

Distribution: The occurrences of the representatives of *Sphaeroceras* s.s. suggest a wide distribution, having been recorded from the Caucasus (KAKHADZE 1937, p. 137), from North America (IMLAY 1962, p. 11; 1973, p. 81), from the Kuban Valley (ZATWORNITZKY 1914, p. 552; KAKHADZE and ZESASHVILI 1956, p. 28), Iran (see in ARKELL 1956, p. 377), and from several European localities. The genus flourished in the Humphriesianum and basal Subfurcatum Zones, and vanished abruptly leaving no direct descendants, in the Upper Bajocian.

Dimorphism: First to study the dimorphism of *Sphaeroceras* was MAKOWSKI (1963, p. 46). It is interesting to note, that he treated the genus in a wider sense, giving an example from the Callovian (loc. cit. pl. IX, figs. 1—2). MAKOWSKI suggested infraspecific dimorphism within the genus. The dimorphism of the *Sphaeroceras* s.s. was later studied by WESTERMANN (1964, p. 55), and he suggested subspecifically separable dimorphic pairs as recognizable.

STURANI (1971) in his monograph on Middle and Upper Bajocian ammonites separated the dimorphous pairs at subgeneric level, but the case of the *Sphaeroceras* (incl. *Chondroceras*) appeared as an exception to the rule. On the basis of his extremely rich and stratigraphically well-controlled material, he demonstrated subspecific dimorphous pairs. It is noteworthy, that within the probable ancestor, the genus *Frogdenites*, the possibility of a similar infraspecific dimorphism has recently been recorded (see in PARSONS 1974, p. 167). In this way the close connection of *Frogdenites*, *Sphaeroceras* and *Chondroceras* is suggested also by their dimorphism.

Sphaeroceras tenuicostatum tenuicostatum STURANI, 1971

Pl. XVI, fig. 5

1923. *Sphaeroceras brongniarti* SOW. — FALLOT—BLANCHET, p. 160, pl. XI, fig. 6 (only).
1970. *Sphaeroceras brongniarti* (SOW.) — GALÁCZ, p. 118.
1971. *Sphaeroceras tenuicostatum* n. sp. — STURANI, p. 143, pl. 10, fig. 24, text-fig. 42/4.

Material: A single, well-preserved internal mould.
Dimensions: J9358: 19.5; 11 (56); 13 (67); 3 (15)

Description: A small specimen, with an extremely narrow umbilicus, which is almost occluded—it is actually a sinuous fissure. The whorl-section is strongly depressed, lentil-shaped, with a broadly rounded venter. The ornamentation is a dense ribbing. The narrowly spaced primary ribs are curved-prorsiradiate and bifurcate above the middle of the flanks. The secondaries tend to be radial on the venter. The number of the primary ribs is 32 on the last whorl. The body-chamber is

contracted on the last half whorl. The aperture is partly broken, only the characteristic thin, sharp, prorsiradiate peristomal ridge is preserved. The suture-line is not visible.

Remarks: This specimen, which was previously determined as *S. brongniarti* (Galácz 1970, p. 118), can be well identified with the species *S. tenuicostatum* Sturani. It differs from the other congeneric forms with its denser ribbing, longer primaries, narrower umbilicus and sharp, salient, markedly prorsiradiate apertural ridge. The subspecies *S. tenuicostatum glabrum* Sturani is distinguished from the nominate subspecies by the almost complete loss of ribbing. From the specimens figured by Fallot and Blanchet (1923, pl. XI, figs. 1—6) only those in figs. 1 and 6 can be specifically determined. The form in fig. 1 is most likely a *S. brongniarti* specimen, and the original of fig. 6, with a view to the features of the ribbing and the aperture, is undoubtedly a *S. tenuicostatum*.

Distribution: The type was described by Sturani from the Garantiana Zone of the Southern Alps. At Gyenespuszta it occurs in Bed 16 of Profile VI, i.e. Subfurcatum to Garantiana Zones. Accordingly, this form differs also with its stratigraphic range from *S. brongniarti*, which is confined to the Humphriesianum and basal Subfurcatum Zones.

* * *

Bed 16 yielded an incomplete specimen of extremely poor preservation, with some hardly visible features of the genus *Sphaeroceras*. It is a relatively large specimen resembling the form figured under the name *Sphaeroceras brongniarti* (J. Sow.) by Arkell (1951—59, text-fig. 20/1a-b).

Familia **Tulitidae** Buckman, 1921

Genus BULLATIMORPHITES Buckman, 1921

Type species, by original designation (Buckman 1921 in 1909—30, p. 47), *B. bullatimorphus* Buckman (1922 in 1909—30, pl. 262A-B).

General remarks: *Bullatimorphites* is a genus established for the macroconchiate forms of the characteristic Bathonian "*bullati*" group. Its inner whorls are involute, the outer whorl is excentrically coiled, or in some forms (e.g. *B. bullatimorphus*, *B. perisphinctoides*) the adult stage is planulate. The umbilicus is relatively wide in the nucleus, nearly occluded in the middle whorls and gradually widened again from the beginning of the body-chamber. The ribbing is constituted by prorsiradiate ribs, which bi- or trifurcate in the inner, or the middle part of the flanks. The ribbing of the body-chamber tends to be more widely spaced and fades out gradually. The contracted body-chamber ends in a simple aperture, with a gentle collar in some forms. Suture-line generally simple.

The most closely allied forms are the representatives of the Lower Callovian macroconchiate genus *Kheraiceras* (Spath 1924, p. 7, type species "*Sphaeroceras*" *cosmopolita* Parona and Bonarelli 1897, p. 46, of which the holotype is the *Sphaeroceras bullatum* Waagen 1873—75, p. 29, pl. XXXII, fig. 1). The great similarity of the two genera was enough for Hahn (1971) to subordinate *Kheraiceras*, as a subgenus, to *Bullatimorphites*, and to assign *B. bullatus* (d'Orbigny), one of the most characteristic species of *Bullatimorphites*, to *Kheraiceras*. However, as it suggested earlier by several authors, *Kheraiceras* is distinguished by numerous features from its Bathonian ancestor. The *Kheraiceras* species are comparatively smaller or medium-sized, with spindle- or barrel-shaped inner whorls, an entirely occluded umbilicus and a swollen umbilical area. (For typical *Kheraiceras* nuclei, see Roman 1924, pl. III, figs. 13, 13a; Sayn and Roman 1928, pl. X, fig. 9, pl. XI, fig. 6.) The umbilicus remains occluded or extremely narrow on the middle whorls, where the coiling is cadicone (see Kuhn 1939, pl. VII, figs. 1a-b). Over the last half whorl the coiling apparently does not change, but the umbilicus widens suddenly, owing to the abrupt and heavy contraction of the dorsal part of the body-chamber. The ribs are rectiradiate, generally simple or furcating in some forms, but the furcation point falls generally below the middle of the flanks (cf. Parona and Bonarelli 1897, pl. V, fig. 1). The peristome is simple in all cases. The suture-line is generally rather complex (see Spath 1928, pl. XLVII, fig. 6; Couffon 1917—19, text-fig. 34), showing the wide second lateral lobe so characteristic of the tulitids (cf. Arkell 1951—59, p. 82).

On the basis of the above morphologic features, the separation of the two genera seems to be well-established, however, some Upper Bathonian transitional forms do exist. According to the morphologic characters, *Ammonites bullatus* d'Orbigny undoubtedly belongs to the genus *Bullatimorphites*. This latter species is apparently the most commonly recorded form, which is of stratigraphic value. On the basis of the various *B. bullatus* figures in the earlier literature, this form appears to be represented by two varieties, one smaller, comparable to the type specimen, and another larger, first figured by Gemmellaro (1872, pl. III, figs. 4a-b) from Sicily. Transitional forms are hitherto unknown, thus the two forms may be separable as subspecies.

ARKELL (1951—59, p. 107), when designating the lectotype, apparently regarded this species as Upper Bathonian, but subsequently CARIOU (1967, p. 4) argued, that D'ORBIGNY (1850—52, p. 570) had erroneously recorded this species from the Bathonian. As a matter of fact, studies on the type area (Niort, Deux-Sèvres, Poitou) supported this latter statement (GABILLY 1964, p. 70). French authors (see e.g. MOUTERDE et al. 1971, p. 16) regard *B. bullatus* as the subzonal index of basal Lower Callovian Macrocephalus Zone. This is in accordance with the original proposal of OPPEL (1856—58, p. 504). This species is certainly most common in the lowermost Callovian, it is true, but studies by HAHN (1971) and other earlier records show that typical *B. bullatus* appears in the Upper Bathonian, too.

The genus *Bullatimorphites* comprising several species, is undoubtedly the most characteristic Bathonian sphaerocone ammonite, regardless of the geographically restricted *Tulites*. On the other hand, the origin of this distinguished group is still rather obscure. ARKELL (1951—59, pp. 82—84; 1957, p. L292) thought that the Bathonian tulitids were direct derivatives of the Middle-Upper Bajocian sphaeroceratids, and he explained the lack of uppermost Bajocian and lowermost Bathonian transitional forms by lithofacies causes.

The highly interesting conclusions of HAHN (1971, p. 66) which he drew from the studies of *Bullatimorphites* nuclei, are worthy of mention. The inner whorls of *Bullatimorphites* are not sphaerocone, as commonly stated, and show parabolic nodes in the ornamentation (cf. SCHINDEWOLF 1961—68, p. 448). According to HAHN, this suggests that the tulitids form an offshoot of *Z. (Procerozigzag)* origin, which produced *Sphaeroceras* homoeomorphs in the Bathonian. This hypothesis needs additional evidence, but certain features of the ribbing and the suture-line make it very plausible.

The Callovian lateral offshoot of *Bullatimorphites* is *Kheraiceras*, with which it is connected by intermediate forms (e.g. LISSAJOUS 1923, pl. XIX, fig. 1, pl. XX, fig. 1, see SPATH 1928, p. 202).

Bullatimorphites, similarly as the other tulitids, is a strongly dimorphic genus, though the taxonomy of the microconch pairs show some disagreements. It is likely, that the stratigraphically earlier forms of macroconch *Bullatimorphites* can be paired with microconch *Sphaeroptychius*, while the stratigraphically later *Bullatimorphites* species correspond to microconchiate *Treptoceras*. On the other hand, the microconch *Bomburites* can be matched with *Kheraiceras* (see CALLOMON 1963, p. 32). With a view to uncertainties in the generic arrangements of the microconchiate species, let us try to review here the three microconch groups.

Sphaeroptychius LISSAJOUS, 1923. Type species, by original designation, *Sphaeroptychius buckmani* LISSAJOUS (1923, p. 101, pl. XXII, figs. 3—4). Microconch forms with a relatively wide umbilicus, a characteristically flat or concave periumbilical area and a sharp umbilical edge. The ribbing consists of fine ribs. Parabolic nodes occasionally appear. The ribbing fades out on the contracted body-chamber. The type species has large, spatulate lappets, other congeneric species have shorter auricules. In some forms a weak preapertural constriction occurs, and the peristome bears a large ventral flare. As suggested by ENAY (1959, p. 256), *Schwandorfia* ARKELL (1951, p. 10) is a junior synonym of *Sphaeroptychius*. Judging by the figured entire specimen of the type species of *Schwandorfia (S.) marginata* (see ENAY loc. cit. pl. VIIb, figs. 1—2) this suggestion is justified.
Beside the type species and *Sphaeroptychius marginatus*, other known congeneric forms are: "*Schwandorfia*" *lanquinei* (ARKELL 1951—59, p. 87, text-fig. 25), and "*Ammonites*" *lucasi* (DE GROSSOUVRE 1888, p. 388, pl. IV, figs. 8a-b).

Treptoceras ENAY, 1959. Type species, by original designation *Treptoceras laurenti* ENAY (1959, p. 253, pl. VIIb, fig. 4; = *Sphaeroceras microstoma* in RICHE—ROMAN 1921, p. 152, pl. VII, fig. 11). This genus unites the "small *Bullatimorphites*" and the *Ammonites microstoma* group known from the Bathonian and Callovian. The size larger than in *Sphaeroptychius*, the sphaerocone coiling with an almost occluded umbilicus on the inner and middle whorls and the evolute, excentric body-chamber, are characteristic features. The periumbilical area is rounded, the ribbing is somewhat irregular, the furcation points lie on the inner third of the flanks. The characteristically projected apertural margin bears a strong collar and short lappets.
According to the studies by ENAY (1959), it is evident that this genus comprises, besides *T. laurenti* and *T. crimaciense*, the previously described *Sphaeroceras suevicum* ROEMER, 1911, *Sphaeroceras Uhligi* POPOVICI-HATZEG, 1905 and *Ammonites microstoma* D'ORBIGNY, 1846. Probable congeneric forms are *Schwandorfia boulangeri* (COLLIGNON 1958, pl. XI, fig. 58) from Madagascar, *Bullatimorphites calloviense* (MAUBEUGE 1975, p. 112; = the junior synonym of *T. microstoma*) from the Lower Callovian of the Basel area, and some microconch tulitids from New Guinea (WESTERMANN and GETTY 1970, pl. 53, figs. 1—2).

Bomburites ARKELL 1952. Type species, by original designation (ARKELL 1951—59, p. 90), *Am. devauxi* DE GROSSOUVRE (1891, p. 361, pl. IX, figs. 6a-c). This is the *Am. bombur* (OPPEL, 1862,

p. 150, pl. XLVIII, fig. 3) group, which is characterized by its small size, cadicone coiling and barrel-shaped general form. The umbilicus is occluded on the inner and middle whorls, with a swollen periumbilical area, similarly to the case of *Kheraiceras*. On the last half whorl the body-chamber is suddenly contracted, and terminates in a thick apertural margin. In some species a constriction appears behind the peristome, but lappets are absent. The ribbing is dense, rectiradiate or radial.

HAHN (1971) regarded *Bomburites* as a synonym of *Treptoceras*, but the two genera are well-distinguished by coiling, whorl-section, ribbing and apertural features. Besides *B. devouxi* and *B. bombur*, other congeneric forms are *Stephanoceras globuliforme* GEMMELLARO (1872, p. 187, pl. III, fig. 5, pl. V, fig. 3), *Am. aeropus* (D'ORBIGNY 1847, p. 330), *Sphaeroceras prahequensis* PETITCLERC (1915, p. 104, pl. XII, fig. 4) and *Sphaeroceras weigelti* KUHN (1939, p. 471, pl. VII, fig. 3).

The above summary clearly shows that the three microconchiate groups are well-distinguished on morphological grounds. The *Kheraiceras-Bomburites* dimorphic pairing is similarly evident both morphologically, and stratigraphically. The specific matches of the certain forms need further study. As suggested by ENAY (1959), and subsequently by CALLOMON (1969, p. 114), *Treptoceras* is the microconchiate counterpart of *Bullatimorphites*. Within these groups the single specific pair hitherto demonstrated is *B. bullatus* and *T. microstoma*. The matches of other specific dimorph pairs require stratigraphic control. *Sphaeroptychius* seems to be another microconch of *Bullatimorphites*, but it remains for further detailed studies to designate dimorphic pairs of *Sphaeroptychius* plus Lower Bathonian *Bullatimorphites*.

If the macroconch-microconch pairs outlined above gain final evidence, the following subgeneric taxonomy of the Bathonian-Callovian tulitids are to be used (see also TORRENS 1971):

Macroconchs	microconchs
Kheraiceras (Kheraiceras)	*Kheraiceras (Bomburites)*
Morrisiceras (Morrisiceras)	*Morrisiceras (Holzbergia)*
Tulites (Tulites)	*Tulites (Trolliceras)*
Tulites (Rugiferites)	
Bullatimorphites (Bullatimorphites)	*Bullatimorphites (Treptoceras)*
	Bullatimorphites (Sphaeroptychius)

Distribution: Earliest *Bullatimorphites* appear in the upper part of the Zigzag Zone (HAHN 1971). Certainly Lower Bathonian form is the *B. latecentratus* (QUENSTEDT), and presumably *B. ymir* (KUDERNATSCH) also. From the viewpoint of dimorphism, it is important, that HAHN (1971, pp. 104—106) found *Sphaeroptychius* in the Zigzag Zone and that this way a supposed *Rugiferites-Sphaeroptychius* pairing appears unlikely. Several *Bullatimorphites* and associated *Sphaeroptychius* and *Treptoceras* occur in the Middle Bathonian, and these three subgenera remain characteristic in the Upper Bathonian too. The Bathonian/Callovian boundary was crossed only by *Bullatimorphites* and *Treptoceras*. In the Lower Callovian the *Kheraiceras-Bomburites* pair appears. *Bullatimorphites* endures into the Upper Callovian Athleta Zone (HAHN 1971, pl. 7, fig. 4), and the common records of *T. microstoma* from the Callovian suggest a similar extended range of *Treptoceras*.

Bullatimorphites and its microconch pairs are known in a wide geographic distribution. The localities mainly belong to the Tethyan realm. In addition to the well-known NW European and European Mediterranean localities, *Bullatimorphites* was recorded from N Africa (ROMAN 1930) from Madagascar (COLLIGNON 1958), from Kutch (SPATH 1928, pl. XCVI, figs. 8a-b = a typical *Treptoceras*), from Baluchistan (NOETLING 1896), from Uzbekistan (KRYMHOLZ and ZACHAROV 1971), and from the Indopacific Region (BOEHM 1912, WESTERMANN and GETTY 1970). These latter authors (loc. cit. pp. 257, 295) mentioned that the peculiar *Bullatimorphites* of the Indopacific Region are known also from South America.

Bullatimorphites eszterense (BÖCKH, 1881)

Pl. XVII, fig. 1

1881. *Stephanoceras Eszterense* n. sp. — BÖCKH, p. 49, pl. VII, fig. 1, pl. VI, fig. 3.
1969. *Bullatimorphites bullatus* (ORB.) — MIHAJLOVIČ, p. 66, pl. VI, fig. 1, 1a.
1970. *Bullatimorphites eszterense* (BÖCKH) — GALÁCZ, p. 121.

Material: Two entire and four fragmentary internal moulds.

Dimensions:

J9308:	111;	41 (37);	?45 (?41);	39 (35.5)
	86;	38 (44);	60 (70);	21 (24.5)
J9309:	103;	41 (40);	44 (43);	34 (33)
	86;	40 (46.5);	58 (67);	23 (27)
J9310:	61;	34 (56);	48 (79);	11 (18)

Description: The figured specimen is a medium-sized, relatively well-preserved internal mould. The umbilicus is very narrow on the inner whorls and widens abruptly at the beginning of the last whorl. The whorl-section is oval, with its maximal width at the lower third of the flanks. The ornamentation consists of a rather strong ribbing, which fades out on the body-chamber. On the inner whorls the dense primary ribs are prorsiradiate and bi- or trifurcate at the middle of the flanks. On the body-chamber the ribbing weakens gradually toward the aperture, where only some strong secondary ribs are visible on the venter. The contracted body-chamber begins at about 60 mm diameter, its length is about 3/4 whorl. The aperture is simple. No suture-line is visible.

Remarks: This *Bullatimorphites*, which was described from the Mecsek Mountains (Southern Hungary), belongs to the group of smaller forms of this genus. A similar form is the species *B. latecentratus* (Quenstedt), but it differs with its more depressed whorl-section and strongly ribbed body-chamber. *B. bullatus* (d'Orbigny) is a more inflated form, with a completely smooth body-chamber.

Distribution: This species was selected as an index form in the Mecsek Mountains Bathonian by Böckh. His "Eszterense Beds" correspond to the Subcontractus, Morrisi and Retrocostatum Zones. At Gyenespuszta the *Bullatimorphites eszterense* specimens were collected from Bed 3 of Profile VI, i.e. from the upper part of the Middle Bathonian, Subcontractus Zone.

Bullatimorphites stephanovi n. sp.

Pl. XVII, fig. 2, Pl. XVIII, fig. 1, Text-fig. 63

1963. *Bullatimorphites bullatus* (d'Orbigny) — Stephanov, p. 182, pl. V, fig. 1 (only).
1970. *Bullatimorphites* sp. nov. — Galácz, p. 121, 125.

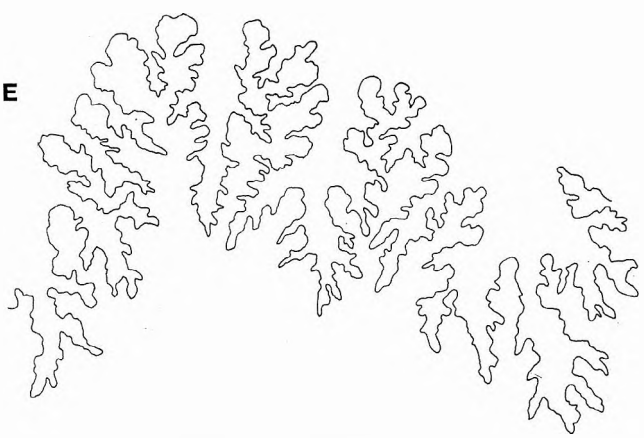
Holotype: Pl. XVII, fig. 2, Pl. XVIII, fig. 1; J9312.
Locus typicus: Gyenespuszta, Northern Bakony, Transdanubian Central Mountains, Profile VI.
Stratum typicum: Bed 1, basal Upper Bathonian, Prohecticoceras retrocostatum Zone, ammonitico rosso limestone.
Derivatio nominis: In tribute to the late J. Stephanov, who was the first to figure this form.
Diagnosis: Large-sized *Bullatimorphites* with a less depressed whorl-section, widely-spaced ribs persisting up to the end of the body-chamber.
Material: Besides the holotype, 3 entire internal moulds and some phragmocone fragments.

Dimensions:	J9311: 165;	51 (31);	?64 (?39);	67 (40)
	127;	50 (40);	60 (47);	41 (32)
Holotype,	J9312: 150;	48 (32);	50 (33);	62 (41)
	J9313: 148;	48 (32.5);	?58 (?39);	62 (42)

Description: The holotype is a large internal mould of somewhat corroded surface. The umbilicus is narrow up to the end of the phragmocone, and suddenly widens from the beginning of the body-chamber; the coiling is excentric. The whorl-section is semicircular with its maximal width at the lower third of the flanks. Because of the corroded surface of the specimen, the ornamentation is partly visible. The ribs on the last whorl of the holotype are broad and low, on the last 1/5 of the phragmocone there are 8 outer ribs. The body-chamber, which begins at about 95 mm diameter, comprises 4/5 of the last whorl. It is ribbed over its full length with strengthened outer ribs near the aperture. The body-chamber is gradually contracted, the aperture is simple and is bordered by a weak constriction.

The suture-line (Text-fig. 63) is partly visible. On the holotype only the wide and high first lateral saddle is preserved.

Remarks: This new *Bullatimorphites* species differs from the other congeneric forms mainly by its ribbed body-chamber. *B. costatus* Arkell (holotype: "*Sphaeroceras bullatum* d'Orbigny" in Lissajous 1923, pl. XVIII, fig. 1) shows a similarly ribbed body-chamber, but the ribs on this form are denser, with finer secondaries. *B. latecentratus* (Quenstedt) (holotype refigured by Hahn 1971, pl. 6, fig. 3) can be distinguished by its smaller size. On the basis of the lectotype figures of Arkell (1951—59, text-fig. 34) *B. bullatus* (d'Orbigny) is a smaller form with a more inflated phragmocone and a depressed



Text-fig. 63. Suture-line of *Bullatimorphites stephanovi* n. sp. Holotype (J9312), VI/1, Retrocostatum Z.

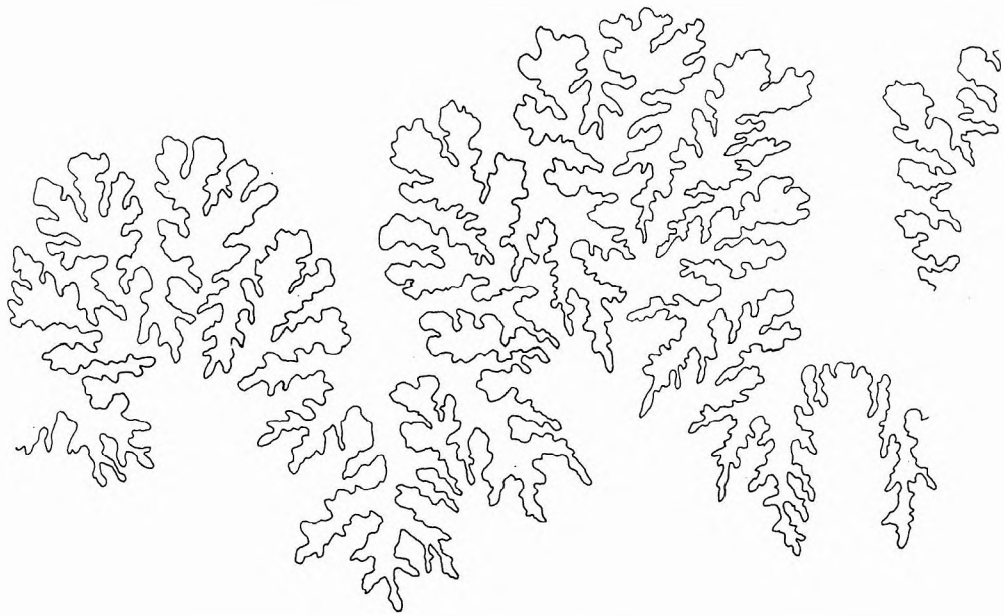
body-chamber. From the forms presented previously in the literature only that figured by STEPHANOV (1963) on his pl. V, under the name *B. bullatus* can be assigned to the new species. The Bulgarian specimen is of better preservation, and the style of ribbing is more clearly visible.

Distribution: The holotype and the other specimens of Gyenespuszta have come from the lower part of the Retrocostatum Zone (Bed 1 of Profile VI). According to STEPHANOV, the Bulgarian specimen belongs to the Morrisi Zone. However, in this Bulgarian sequence the Morrisi Zone was identified by relying on a phragmocone fragment of a *Bullatimorphites*, misidentified as *Morrisiceras* (see TORRENS 1967), therefore the exact horizon is doubtful.

* * *

In the Gyenespuszta profiles, especially in Beds 3 to 1 (Middle and Upper Bathonian), several, specifically indeterminable *Bullatimorphites* specimens were collected. The majority of these specimens are inner whorls, thus in absence of the body-chamber, the tendencies in the coiling and ribbing cannot be evaluated.

An interesting form occurred in Bed 1 of Profile VI (*Bullatimorphites* sp., Pl. XVIII, fig. 2). This is a medium-sized, narrowly umbilicated specimen [measurements: 82; 48 (59); ?58 (?71); 11 (11.5)],



Text-fig. 61. Suture-line of *Bullatimorphites* sp. (J9313), VI/1, Retrocostatum Z.

which is septate up to 65 mm diameter, with half of a whorl of the preserved body-chamber. The body-chamber is apparently not contracted. The ribbing is unique: it consists of weak, rounded primaries, curved forwards, which branch at irregular flank height into secondaries, in a rather virgatotome fashion. The secondary ribs are strongly projected. The suture-line (Text-fig. 64) is of *Bullatimorphites* type. Although no similar form is known in the literature, but designation of a new species on the single, incomplete specimen available is impossible.

Genus TULITES BUCKMAN, 1921

Subgenus TULITES (RUGIFERITES) BUCKMAN, 1921

Type species, by original designation (BUCKMAN 1921 in 1909—30, p. 46), *R. rugifer* BUCKMAN, 1909—30, pl. 338, from the Middle Bathonian of Dorset, Southern England.

General remarks: *Rugiferites*, usually regarded as a subgenus of *Tulites*, is distinguished from the nominate subgenus in having a more evolute coiling, less depressed whorl-section and finer, more irregular ribs. Some forms closely resemble some *Tulites*, others are akin to certain *Bullatimorphites* species. Thus further studies on the inner whorls and suture-lines of specimens from a rich material may result in the assignement of the *Rugiferites* species to these two genera.

In this present state of knowledge *Rugiferites* appears to be a short-lived offshoot of the *Tulites*, which got extinct in the upper part of the Middle Bathonian, leaving no descendant.

Distribution: Regarding *Rugiferites* as an independent taxon, it seems to substitute *Tulites* s.s. in Mediterranean areas. *Rugiferites* occurs frequently in NW European areas, but true *Tulites* are apparently missing in the Mediterranean region (except Arabia, see ARKELL 1952). *Rugiferites* is recorded from Indonesia [*T. (R.) godohensis* (BOEHM 1912, pl. 35, figs. 1a-b, see ARKELL 1951—59, p. 82; 1956, p. 439), from Sicily (WENDT 1964, p. 137), from the Tatras (PASSENDORFER 1935, p. 20), the Southern Alps (STURANI 1964a, p. 34; 1964a, p. 47)]. Gyenespuszta belongs to the last group of localities.

The stratigraphic range of the subgenus is narrow being restricted to the lower part of the Middle Bathonian Subcontractus Zone.

Dimorphism: According to HAHN (1971, p. 83), the microconch pair of *Rugiferites* should be searched in the evolute species of *Sphaeroptychius*. However, on morphologic ground, *Sphaeroptychius* can be better paired with *Bullatimorphites* (see above). Other possibility is *Trolliceras*, but this latter subgenus has been recorded from the higher part of the Subcontractus Zone so far (see TORRENS 1970). Nevertheless, the latter match is to be more likely, but records of lower Subcontractus Zone *Trolliceras* are needed for a final justification.

Tulites (Rugiferites) serpenticonus (ARKELL, 1954)

Pl. XVI, fig. 7, Pl. XVIII, figs. 3—4, Pl. XIX, fig. 1, Text-figs. 65, 66

1954. *Bullatimorphites serpenticonus* sp. nov. — ARKELL (1951—59), p. 111, text-fig. 38.
1970. *Tulites (Rugiferites) serpenticonus* (ARKELL) — GALÁCZ, pp. 121, 124.

Material: 4 entire specimens (internal moulds) and 4 phragmocone fragments of different size.

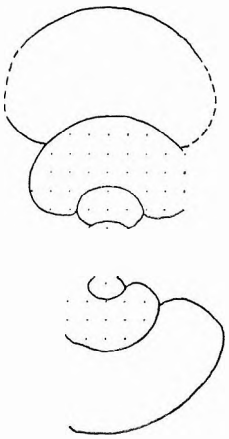
Dimensions:

J9318:	111;	40 (36);	43 (39);	45	(40.5)
	95;	36 (38);	52 (55);	35	(37)
J9315:	106;	36 (34);	46 (43.5);	42	(40)
	81;	33 (41);	40 (49.5);	23.5	(29)
J9322:	94;	33 (35);	42 (45);	40	(42.5)
J9319:	93;	34 (36.5);	38 (41);	37	(40)
	76;	31 (41);	41 (54);	25	(33)
J9320:	87;	31 (36);	31 (39);	35	(40)
	71;	31 (43.5);	35 (49);	22	(31)
J9316:	56;	27 (53);	40 (71);	13	(23)
J9317:	53;	29 (55);	40 (75);	11	(21)
J9321:	53;	24 (45);	?42 (?79);	13	(24.5)

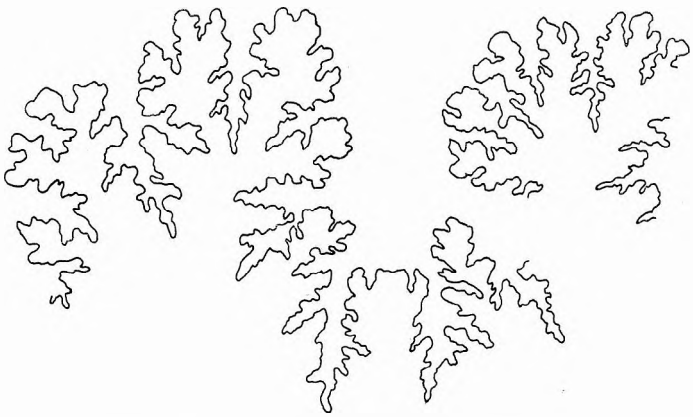
Description: The figured specimens are internal moulds of medium state of preservation. The umbilicus on the inner whorls is narrow and deep, becoming gradually wider on the last whorl. The whorl-section is depressed-oval with its maximal width at the half of the flanks. The ribbing is strong on the inner whorls, with dense, radial, biplicate ribs. The furcation points lie at the half of the whorl-height. The ornamentation of the body-chamber is different. On the last half whorl the primary ribs become stronger and more widely spaced. Near the aperture the ribs form a marked undulation on the venter. The length of the contracted body-chamber is about 3/4 of a whorl and begins at 70 to 90 mm diameter. Near the simple aperture the whorl-section is different, being high-oval, nearly triangular.

The suture-line (Text-fig. 66) is well-divided. The first lateral saddle is high and wide, the second lateral saddle is lower and more simple. On a phragmocone fragment the wide, two-pronged second lateral lobe, characteristic of *Tulites* s.l. is quite distinct.

Remarks: This species was originally placed into the genus *Bullatimorphites* by ARKELL (1951—59, p. 111), but he emphasized its possible belonging to *Rugiferites*. Given its wider and more gradually increasing umbilicus and the style of ribbing, this species certainly belongs to *Rugiferites*. This arrangement is justified also stratigraphically, as the form occurs in the type region (Dorset, Southern England) in the lower Subcontractus Zone, where, vertically separated from *Tulites* s.s., *Rugiferites* is characteristic (TORRENS 1967, and oral communication). *Rugiferites serpenticonus* is most probably an intermediate form between *Bullatimorphites*, a taxon appearing in the Lower Bathonian and the *Tulites-Rugiferites*, a short-lived, intra-Middle Bathonian offshoot. A similar intermediate form is the *Rugiferites sofanus* (BOEHM 1912, p. 150, pl. XXXV, figs. 2a-b), recently recorded from some European basal Middle Bathonian occurrences (see GABILLY 1964, MANGOLD et al. 1967, KRYSTYN 1972).



Text-fig. 65. Whorl-section of *Tulites (Rugiferites) serpenticonus* (J9315), VI/5, Subcontractus Z.



Text-fig. 66. Suture-line of *Tulites (Rugiferites) serpenticonus* (J9316), VI/5, Subcontractus Z.

Distribution: As mentioned above, the type came from the Subcontractus Zone of Southern England. The Gyenespuszta specimens have been collected from Beds 5 and 4 of Profile VI, therefore these beds belong to the Subcontractus Zone.

Superfamilia **Perisphinctaceae** STEINMANN, 1890
Familia **Parkinsoniidae** BUCKMAN, 1920

Genus ORTHOGARANTIANA BENTZ, 1928

Type species, by original designation (BENTZ 1928, p. 174), *Garantia schroederi* BENTZ (1924, p. 156, pl. 5, figs. 2a-b).

General remarks: According to STURANI (1971, p. 156), *Orthogarantiana*, with its microconchiate subgenus *Torrensia*, represents an independent genus. A transition between Stephanoceratidae and Parkinsoniidae families (cf. STURANI, loc. cit.), this group is important phylogenetically. Its early species in the Subfurcatum Zone partly resemble certain *Normannites* and *Stemmatoceras*, partly some *Cadomites* of similarly Subfurcatum Zone (cf. PAVIA 1972, pp. 105—106). However, this resemblance is an apparent similarity, rather than a real phylogenetic connection.

The representatives of the genus *Orthogarantiana* range up into the Parkinsoni Zone (STURANI 1971, p. 156), but previously, in the Subfurcatum Zone, they gave rise to the genus *Garantiana* and its allies.

Distribution: This genus has been recorded only from European localities, from the Mediterranean and the NW European areas. Its vertical range extends up to the Subfurcatum, Garantiana and Parkinsoni Zones.

Dimorphism: Like the other perisphinctids, *Orthogarantiana* forms a dimorhic group. The dimorphic pair *(Torrensia)* was suggested by STURANI (1971). It is worth mentioning, that the morphology of *Torrensia*, with its stephanoceratid habit, justifies also the stephanoceratid origin of Parkinsoniidae.

Orthogarantiana cf. **bifurcata** (ZIETEN, 1830)

Pl. XIX, figs. 2, 4, Text-figs. 67, 68

1830. *Ammonites bifurcatus* — ZIETEN, p. 4, pl. III, figs. 3a-c.
1915. *Garantia bifurcata* ZIETEN — DOUVILLÉ, p. 14, pl. II, figs. 6, 9, pl. IV, fig. 5 (only).
1923. *Garantia bifurcata* ZIETEN sp. — FALLOT—BLANCHET, p. 115, pl. II, fig. 6.
1927. *Garantia bifurcata* ZIETEN — ROMAN—PÉTOURAUD, p. 20, pl. VII, figs. 2—4 (only).
1928. *Garantiana (Orthogarantiana) bifurcata* (v. SCHLOTHEIM) ZIETEN — BENTZ, p. 186, pl. 17, figs. 2a-d.
non 1956. *Garantiana bifurcata* ZIET. — KAKHADZE—ZESASHVILI, p. 44, pl. VII, fig. 6.

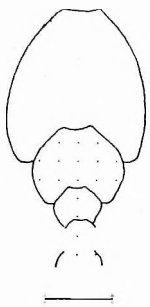
Material: 6 internal moulds of different state of preservation.
Dimensions: J9374: 66; 22 (33); 20 (30.5); 29 (44)
J9373: 62; 22 (35); 20 (32); 24 (39)
J9371: 52; 19 (37); 16 (31); 21 (40)
J9372: 52; 18.5 (35.5); 16 (31); 21 (40)

Description: Medium-sized form with a relatively narrow umbilicus and a low and oblique umbilical wall. The flanks are flattened, the umbilical edge is rounded and the ventrolateral edge is angular. The whorl-section (Text-fig. 67) is high-oval, with a narrow venter and a wide smooth band on it. The primary ribs are somewhat curved and bifurcate a little above the medium whorl-height, without tubercules. On the venter the radial secondary ribs end in tiny and sharp tubercules. There is no complete specimen in the material, thus the length of the body-chamber and the features of the aperture cannot be studied.

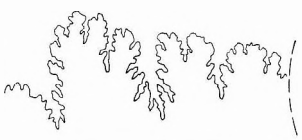
The suture-line (Text-fig. 68) is well-divided, with narrow lobes and wide saddles. It strongly resembles the figure of Bentz (1928, pl. 17, fig. 2d).

Remarks: The Gyenespuszta specimens differ from the typical *O. bifurcata* with their more widely spaced ribs. On the other hand, other features (the lack of lateral tubercules, the bifurcate ribbing, the high-oval whorls and the suture-line) are well consistent with those on the type-figure (Zieten 1830—33, pl. III, fig. 3).

Douvillé (1915) used this specific name in a rather wide sense. From his figures only 6 and 9 on pl. II and 5 on pl. IV can be really assigned to *O. bifurcata*. The specimens on pl. II, fig. 7 and pl. IV, figs. 3—4 are *Orthogarantia crassa* (Bentz) and *O. schroederi* (Bentz), respectively. The forms figured by Fallot and Blanchet (1923) as *Garantiana bifurcata* Zieten sp. var. *acuticosta* can be put rather in the genus *Pseudogarantiana* (cf. Pavia 1972, p. 109). The larger specimen figured by Roman and Pétouraud (1927, pl. VII, fig. 1) is a form from the subgenus *Garantiana (Hlawiceras)*, while the original of pl. VI, fig. 7 seems to represent rather the inner whorls of the species *Orthogarantiana rhomboidea* (Bentz). Under the name *G. bifurcata*, Kakhadze and Zesashvili figured a form (1956, pl. VII, fig. 6) from the Upper Bajocian of the Kuban Valley, but it has too wide an umbilicus to be identified with any species of *Garantiana* s.l.



Text-fig. 67. Whorl-section of *Orthogarantiana* cf. *bifurcata* (J9375), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 68. Suture-line of *Orthogarantiana* cf. *bifurcata* (J9372), VI/16, Subfurcatum and Garantiana Z.

Distribution: The horizon of the type form from Germany is uncertain. In the works of Bentz (1924, 1928) and Wetzel (1937) there are no references concerning the stratigraphic range of this species, but it seems to be confined to the Subfurcatum and lower Garantiana Zones. The forms described occur at Gyenespuszta in Bed 16 of Profile VI (i.e. Subfurcatum and Garantiana Zones).

Genus GARANTIANA Mascke, 1907

Subgenus GARANTIANA (GARANTIANA) Mascke, 1907

Type species, by original designation (Mascke 1907, p. 34), *Ammonites garanti* d'Orbigny (1842—51, p. 377, pl. 123, figs. 1—5). The lectotype (d'Orbigny, loc. cit. pl. 123, figs. 1—2) was designated and refigured by Arkell (1956, pl. 35, figs. 2a-b).

General remarks: The nominate subgenus of *Garantiana* comprises medium- or relatively large-sized early Perisphinctacea, with mainly biplicate and sometimes triplicate, radial ribbing which carries especially on the inner and middle whorls, some lateral tubercules, on the venter with a broad median furrow and a simple aperture.

The origin of *Garantiana* s.s. seems rather problematic. Recently Sturani (1971, p. 156) suggested that *Garantiana* can be best related to the earlier *Orthogarantiana*. This suggestion implies again the phylogenetic importance of *Orthogarantiana*, which is, in this way, the ancestral stock of the whole Parkinsoniidae family, since certain *Garantiana* s.s. species undoubtedly produced typical Upper Bajocian *Parkinsonia*.

Distribution: The representatives of the subgenus *Garantiana* appear equally at Mediterranean and NW European Upper Bajocian localities. Especially common in Tethyan occurrences, where they are distributed from the Pamir, through the Donetz Basin and Caucasus to several

Mediterranean localities in Northern Africa and Southern Europe. Recently, *Garantiana* was recorded (without closer determination) from Japan (SATO 1962, p. 894).

The earliest forms of this subgenus appear in the upper Subfurcatum Zone, i.e. in the basal Baculata Subzone. *Garantiana* s.s. species is abundant in the Garantiana Zone, and some forms survive in the lower part of the Parkinsoni Zone.

There are some scattered records from the Bathonian. LISSAJOUS (1923, pp. 49—52, pl. III, figs. 1—3, pl. IV, figs. 1—2) described two species from his "Zigzagiceras arbustigerum Zone" (=Middle Bathonian). One of them (*G. bathonica* LISSAJOUS) was subsequently recorded from the Bathonian (e.g. MAUBEUGE 1950, p. 8) and also from the Bajocian Garantiana Zone (GILLET 1937, p. 96). In the Maconnais the two *Garantiana* species appear together with typical *Spiroceras orbignyi*, another Upper Bajocian ammonite, and this fact suggests these forms to have come from some deeper horizons, and LISSAJOUS (or perhaps ROMAN, the publisher after the death of LISSAJOUS) was deceived by an error of sampling. On the other hand, the whole Macon ammonite material is in an urgent need of an accurate stratigraphic checking.

Another "Bathonian" *Garantiana* occurrence was recorded by BIGOT (1934, p. 712, pl. XLI, figs. 1—2) from Normandy. Judging from his figures, these are typical small *Orthogarantiana* associated with a *Spiroceras* species and a small *Cadomites*. On the basis of these ammonites, the fauna rather suggests an Upper Bajocian age (see ARKELL 1956, p. 50). As for the other, non-figured Bathonian *Garantiana* records (see ARKELL 1956, p. 150), it is important to bear in mind, that these may refer to the representatives of the Upper Bathonian homoeomorph genus *Hemigarantia*, too.

Dimorphism: The microconch pairs of *Garantiana* s.s. are partly the subgenus *Pseudogarantiana* (see WESTERMANN 1964, p. 36; CALLOMON 1969, p. 113) and partly the genus *Strenoceras* (STURANI 1971, p. 153). On the other hand, the phylogenetic relation of these microconch forms is somewhat problematic. Whereas the relation between the macroconchiate *Orthogarantiana* and *Garantiana* seems to be confirmed (see above), the *Torrensia* (microconch subgenus of *Orthogarantiana*) and *Strenoceras* (microconch pair of the earlier *Garantiana*) are morphologically rather different.

Garantiana (Garantiana) protracta (BENTZ, 1924)

Pl. XIX, fig. 5

1915. *Garantiana baculata* QUENSTEDT — DOUVILLÉ, p. 17, pl. V, figs. 1, 2, 4 (only).
1924. *Garantia protracta* nov. spec. — BENTZ, p. 155, pl. 4, figs. 14a-b.

Material: A single, poorly preserved internal mould.
Dimensions: J9380: 61; 22 (36); 17 (28); 24 (39)

Description: Medium-sized form, with a wide umbilicus, a low and oblique umbilical wall and a rounded umbilical margin. The whorl-sides are somewhat convex and meet the wide, depressed, sulcate venter in an angular ventrolateral edge. The dense ribbing is built up of prorsiradiate primary and curved secondary ribs. On the last half whorl of the body-chamber there are 18 primary and about 38 secondary ribs. No tubercules at the furcation points, but the secondaries end in small, acute tubercules on the sides of the ventral furrow. The adult specimen here described bears a slightly excentrically coiled body-chamber of 4/5 whorl length. The adult peristome is simple. The suture-line is not visible.

Remarks: The species *G. (G.) protracta* differs from the other *Garantiana* species by its compressed whorl-section, wide ventral furrow, the dense ribbing and the lack of the lateral tubercules. According to the figures of BENTZ (1924, pl. 4, figs. 14a-b), the original is a somewhat laterally crushed specimen, and this has resulted in an apparently narrower ventral sulcus.

From the several "*G. baculata*" of DOUVILLÉ (1915), BENTZ assigned to his *G. protracta* species those on pl. V, figs. 1, 2 and 4. On the basis of the ventral furrow and the compressed whorls, this inclusion seems to be justified, but some differences do exist in the ribbing density and the whorl-height.

Distribution: The type of this species came from the Subfurcatum Zone of N Germany. The Gyenespuszta specimen has been collected from the Subfurcatum Zone too, from Bed 17 of Profile VI.

Garantiana (Garantiana) baculata (Quenstedt, 1858)

Pl. XIX, fig. 3, Text-figs. 69, 70

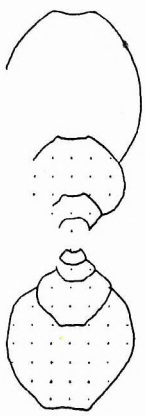
1858. *Ammonites baculatus* — Quenstedt, p. 402, pl. 72, fig. 1.
1881. *Cosmoceras* cfr. *baculatum* Quenst. sp. — Böckh, p. 57, pl. II, figs. 5a-b.
1887. *Ammonites baculatus* — Quenstedt (1886—87), p. 574, pl. 70, figs. 7, 9—10 (only).
non 1914. *Cosmoceras (Baculatoceras* Mascke) *baculatum* Quenst. — Zatwornitzky, p. 547, pl. XVI, figs. 10—11.
1915. *Garantia baculata* Quenstedt — Douvillé, p. 16, pl. II, fig. 5, pl. V, figs. 3, 5 (only).
1923. *Garantia baculata* Quenst. sp. — Fallot—Blanchet, p. 118, pl. II, figs. 1—13 (only).
1924. *Garantia baculata* Quenstedt — Bentz p. 154, pl. 4, figs. 13a-b, text-fig. 6.
1925. *Baculatoceras baculatum* Quenstedt sp. 1886 — Buckman (1909—30), pl. 581, figs. 1—2.
1927. *Garantia baculata* Quenstedt — Roman—Pétouraud, p. 23, pl. VI, figs. 8—9 (only).
1928. *Garantiana (Garantiana) baculata* Qu. — Bentz, p. 177, pl. 14, figs. 5a-b.
1929. *Cosmoceras (Garantia) baculatum* Quenstedt — Lanquine, p. 309, pl. X, fig. 3.
non 1935. *Garantia baculata* Quenstedt — Roman, p. 22, pl. II, figs. 1, 1a.
non 1935. *Garantia baculata* Quenst. sp. — Bircher, p. 155, pl. XI, figs. 5a-b, text-fig. 26.
non 1935. *Garantia* cf. *baculata* in R. Douvillé — Bircher, p. 156, pl. XI, figs. 6a-b, text-fig. 27.
1957. *Garantia garanti* d'Orbigny — Théobald—Bourquin, p. 41, pl. I, fig. 3 (only).
1970. *Garantiana baculata* (Quenst.) — Galácz, p. 118.
?1971. *Garantiana (Garantiana) ?baculata* (Quenstedt) — Morton, p. 287, pl. 51, figs. 8—9, 11—12.
1972. *Garantiana baculata* (Quenstedt) — Nikanorova, p. 64, pl. I, figs. 3a-b.
1972. *Garantiana (G.) baculata* (Quenstedt) — Pavia, p. 106, pl. 18, figs. 2, 5, pl. 19, figs. 1, 2, 8.
1974. *Garantiana (Garantiana) baculata* (Quenst.) — Dietl, p. 12, pl. 2, figs. 1—2.

Material: 5 internal moulds of different state of preservation.

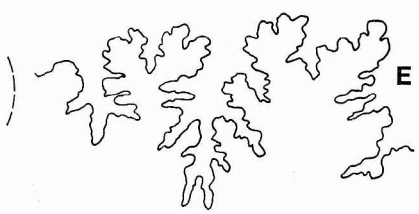
Dimensions:

J9378:	60;	20 (33);	15 (25);	23 (38)
J9379:	50;	20 (40);	17 (34);	17 (34)
J9377:	48;	19.5 (41);	16 (33);	17 (35.5)
J9376:	42;	17.5 (42);	18 (43);	15 (36)

Description: The figured specimen is a small, relatively well-preserved internal mould. The umbilicus is narrow and deep, the umbilical wall is high and convex, the umbilical edge is rounded. The flanks are convex and form a rounded ventrolateral edge with the widely arched venter. The whorl-section (Text-fig. 69) is subcircular, high-oval on the outer whorl, with the maximal thickness near the middle of the whorl-height. The strong, sharp, prorsiradiate and curved primary ribs issue



Text-fig. 69. Whorl-section of *Garantiana (G.) baculata* (J9377), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 70. Suture-line of *Garantiana (G.) baculata* (J9377), VI/16, Subfurcatum and Garantiana Z.

from the umbilical wall and end in circular, sharp tubercules at the middle of the flanks. From the lateral tubercules three sharp, thin, radiate secondary ribs arise, which end in tiny ventral tubercules on the edges of the wide ventral sulcus. The number of the primary ribs on the last whorl is 25. The length of the body-chamber, beginning at about 35 mm diameter, is 3/4 of a whorl. On the body-chamber (regarding the other available specimens), the ribbing is somewhat simpler: the ribs are more widely spaced and the tubercules gradually fade away.

Remarks: *Garantiana (G.) baculata* differs from the other congeneric forms by its narrow umbilicus, wide and circular whorl-section and trifurcate ribbing. The forms characterized by bifurcate ribbing (e.g. Zatwornitzky 1914, pl. XVI, figs. 10—11; Fallot and Blanchet 1923, pl. II, figs.

16—18) seem to be assignable to *G. (G.) dubia* (QUENSTEDT), a species with similar whorls and coiling. Under the name *G. baculata* R. DOUVILLÉ (1915) figured several forms of which only those on pl. III, fig. 5, pl. V, figs. 3 and 5 can be placed into this species. The specimens on pl. IV, fig. 6, pl. V, fig. 5 and pl. VI, figs. 1, 3 are rather *G. (G.) dubia*, while those on pl. V, figs. 1, 2 and 4 are *G. protracta* (see above). LANQUINE (1929, pl. X, fig. 3) figured a form as *G. baculata*, which is entirely different, and seems to be out of the scope of even the genus *Garantiana*. On the basis of its wide ventral sulcus, open umbilicus and simpler ribbing, the specimen of ROMAN (1935, pl. II, figs. 1, 1a) can be rather assigned to *G. (Hlawiceras) subangulata*. The larger specimen figured by BIRCHER (*G.* cf. *baculata*, 1935, pl. XI, fig. 6) is close to *G. (H.) trauthi* WETZEL, the smaller one (pl. XI, fig. 5) is a specifically indeterminable nucleus with bifurcate ribbing. The fragmentary specimens of MORTON (1971, pl. 51, figs. 8, 9, 11, 12) have been excluded from this species by PAVIA (1972, p. 107) (cf. MORTON 1975, p. 83, in explanation of pl. 16).

Distribution: *G. (G.) baculata* is a species of wide geographical distribution; it was recorded from both the Mediterranean and NW European regions. Stratigraphically, it embraces the Subfurcatum and Garantiana Zones. At Gyenespuszta it occurs in Beds 17 and 16 (Subfurcatum and Garantiana Zones) of Profile VI.

Subgenus GARANTIANA (HLAWICERAS) BUCKMAN, 1921

Type species, by original designation, *H. platyrrymum* BUCKMAN, 1921 (in 1909—30, pl. 240, figs. 1—2).

General remarks: For those *Garantiana* species with prorsiradiate ribbing, ventral tubercules and a wide ventral furrow BENTZ (1928) suggested the subgeneric name *Subgarantiana*. Subsequently, ARKELL (1951—59, p. 143; 1957, p. L309) showed that this name was a junior subjective synonym of *Hlawiceras* BUCKMAN 1921. BENTZ (loc. cit.) gave a detailed discussion of the morphology of *H. platyrrymum* BUCKMAN, but concluded that, with its ribbing and septal suture, this form formed a separate genus. However, all of the morphological features suggested by BENTZ as characteristic of his *Subgarantiana* subgenus, are present in *Hlawiceras*. WETZEL (1954, pp. 570—574) derived the certain *Hlawiceras* (=*Subgarantiana*) species from certain stratigraphically earlier *Garantiana* groups. On the basis of his detailed discussions it is clear, that *Hlawiceras* is a morphologic genus with a special combination of *Garantiana* characters, and that this combination can be deduced in several lineages from *Garantiana* s.s. This seems to be confirmed by the fact that in the subgeneric arrangement of the *Garantiana* species the different authors apparently prefer to follow the conventional classification of BENTZ (1928), and do not consider the morphological characters of the individual species. On the basis of the scant and poorly preserved material of Gyenespuszta this latter procedure could have been applied to this work. However, a richer and stratigraphically well-controlled material should necessarily confirm the unity of these two groups. The most promising localities were in this respect those at Bielefeld, NW Germany.

Distribution: According to the studies of WETZEL (loc. cit.), all of the *Hlawiceras* species first appear in the middle of the Garantiana Zone in NW Germany. PAVIA (1972) recorded some *Hlawiceras* specimens from the basal Garantiana Zone from SE France. The subgenus is most common in the lower part of the Parkinsoni Zone, and disappears at the top of the Acris Subzone, probably producing some *Parkinsonia* species.

The geographical distribution of this subgenus seems to be somewhat restricted, but it is probable, that some *Garantiana* s.l. records without subgeneric arrangement partly refer to *Hlawiceras* species.

Dimorphism: The stratigraphically younger group of the subgenus *Pseudogarantiana* appears as the microconch pair of the macroconchiate *Hlawiceras*. On the other hand, this former subgenus comprises some subspecies of both species, and these are at the same time necessarily the microconch pairs of several *Garantiana* s.s. species. As another difficulty, in the lower Parkinsoni Zone, where *Hlawiceras* shows its greatest species- and specimen-number, the representatives of *Pseudogarantia* appear to be scarce. Practically, the only reference to lower Parkinsoni Zone occurrence is that of WETZEL (1954, text-fig. 7) from the Untere Parkinsoni Schichten of NW Germany (=Acris Subzone, see STURANI 1971, p. 158).

Garantiana (Hlawiceras) subangulata WETZEL, 1911

Pl. XIX, fig. 6

1911. *Garantiana subangulata* n. sp. — WETZEL, p. 171, pl. XII, figs. 10—12, text-fig. 16.
1915. *Garantia* aff. *Garanti* D'ORB. — DOUVILLÉ, p. 13, pl. IV, fig. 4 (only).
1928. *Garantiana (Subgarantiana) suevica* WETZEL — BENTZ, p. 190, pl. 16, figs. 2a-d (only).

?1935. *Garantia baculata* QUENSTEDT — ROMAN, p. 22, pl. II, figs. 1, 1a.
1970. *Garantiana* spp. — GALÁCZ, p. 118 (pars).

Material: Two fragmentary specimens.
Dimensions: J9381: 73; 22 (30); 20 (27.5); 32 (44)

Description: The figured specimen is a relatively well-preserved, entire internal mould. The umbilicus is wide and shallow, with a rounded umbilical edge. The flanks are convex and the ventrolateral edge is rounded. The venter is widely-arched, with a moderately wide sulcus. The whorl-section is subcircular. The ribbing consists of slightly projected primary ribs bifurcating somewhat above the middle of the whorl-height. The secondary ribs are slightly curved forwards. At the bifurcation points there are small tubercules, which fade away on the last half of the body-chamber. The ventral tubercules at the ends of the secondary ribs persist up to the peristome. The specimen figured and described here is entire, but the peristome cannot be seen clearly. The length of the somewhat uncoiled body-chamber is about 4/5 of a whorl. Suture-line is not visible.

Remarks: *G. (H.) subangulata* differs from the other *Hlawiceras* species by its subcircular whorl-section, slightly projected ribs and wide umbilicus. Nearest species is *G. (H.) subgaranti* WETZEL, but its ribbing is denser and the fading of the lateral tubercules begins earlier, on the chambered whorls. Another, closely allied species is *G. (H.) trauthi* BENTZ, which differs only in its greater whorl-width and somewhat narrower umbilicus.

On the basis of the original description and figures of WETZEL (1911), the form figured by DOUVILLÉ (1915, pl. IV, fig. 4) under the name *Garantia* aff. *garanti* certainly belongs to this species. A similarly conspecific form was figured by BENTZ (1928, pl. 16, figs. 2a-d), as *G. suevica* WETZEL (cf. WETZEL 1954, p. 566). On this latter internal cast the continued secondary ribs crossing the ventral furrow on WETZEL's and DOUVILLÉ's specimens, cannot be seen.

Distribution: The previously known specimens came from the Garantiana Zone of Normandy (see BENTZ 1928, p. 191; WETZEL 1954, p. 570). The precise stratigraphical position of DOUVILLÉ's specimen within the Upper Bajocian is unknown. The two Gyenespuszta specimens were yielded by Bed 16 (Subfurcatum and Garantiana Zones) of Profile VI.

Garantiana (Hlawiceras) alticosta WETZEL, 1911

Pl. XX, fig. 1

1887. *Ammonites Parkinsoni* — QUENSTEDT (1886—87), p. 599, pl. 71, fig. 18 (only).
1911. *Garantiana alticosta* n. sp. — WETZEL, p. 169, pl. XII, figs. 1—7, text-figs. 12—15.
1970. *Garantiana alticosta* WETZEL — GALÁCZ, p. 119.

Material: A single, fragmentary specimen, with a partly preserved shell.
Dimensions: J9382: 77; 31 (40); 30 (39); 25 (32.5)

Description: A large *Garantiana* with a relatively narrow and deep umbilicus. The umbilical wall is high, convex, with a rounded umbilical edge. The whorl-sides are slightly flattened, and meet the wide, sulcate venter in rounded ventrolateral edges. The whorl-section is trapezoidal with rounded edges, with a maximum width near to the umbilical margin. The strong, prorsiradiate primary rids arise from the umbilical seam, thickening to some extent near the middle of the flanks and bifurcate, without forming any tubercule. The secondary ribs are also prorsiradiate, and end in small tubercules on the sides of the narrow ventral sulcus. The ribbing is considerably weaker on the internal mould. The specimen is chambered up to about 73 mm diameter, the length of the preserved part of the body-chamber is about 1/4 of a whorl. Suture-line cannot be seen.

Remarks: On the basis of its prorsiradiate ribbing, narrow ventral sulcus and the lack of the lateral tubercules, *G. alticosta* certainly belongs to the subgenus *Hlawiceras*. Within this subgenus this species is distinguished by its large size, robust habit and narrow umbilicus.

The form figured by QUENSTEDT (1886—87, pl. 71, fig. 18) was placed by WETZEL in 1911 (p. 165) into his new *Garantiana suevica* species. Subsequently, in 1954 (p. 566), on the basis of morphological characters and stratigraphical occurrence, he restricted his latter specific name to forms with a wide umbilicus and dense, regular ribbing from the Pseudogarantiana Beds (Pseudogarantiana-Schichten = lower Parkinsoni Zone, see WESTERMANN 1967a, p. 126), and he assigned the form figured by QUENSTEDT to the species *G. alticosta*. Judging by QUENSTEDT's drawing, this procedure seems to be justified. Unfortunately, QUENSTEDT's original is a crushed specimen, too fragile to make plaster cast (HAHN 1970, written communication). Therefore the specimen can be studied with scrutiny only on the spot, where QUENSTEDT's collections are reposited.

Distribution: This species has hitherto been recorded from NW Europe, and there is an indication from the Kuban Valley [*Garantiana* sp. (aff. *alticosta* WETZ.) KAKHADZE and ZESASHVILI

1956, p. 47], too. It is a characteristic form in the lower part of the Parkinsoni Zone of Germany (WETZEL 1911, p. 172; 1954, p. 570; BENTZ 1925, p. 166; 1928, p. 193). The Gyenespuszta specimen has also come from the lower Parkinsoni Zone, i.e. from Bed 15 of Profile VI.

Genus CAUMONTISPHINCTES BUCKMAN, 1920

Type species, by original designation, *C. polygyralis* BUCKMAN (1909—30, pl. 163), from the Subfurcatum Zone of Dorset, Southern England.

General remarks: The genus *Caumontisphinctes* unites the early, small parkinsoniids with a typical *Parkinsonia*-ribbing known from the Subfurcatum Zone. As was demonstrated by PAVIA (1972, pp. 113—114), this genus originates from early *Leptosphinctes*, but the further phylogenic connections of the genus are uncertain, as direct transitions to the Parkinsoniidae of the Garantiana Zone are unknown.

Distribution: The genus *Caumontisphinctes* is a relatively common element in the Subfurcatum Zone faunas, both in the Mediterranean and NW European regions. Typical *Caumontisphinctes* are figured from the Caucasus under the name *Kubanoceras kitiae* by KAKHADZE and ZESASHVILI (1956, p. 37, pl. VII, fig. 1).

Dimorphism: The microconch pairs of the macroconchiate *Caumontisphinctes* are in the subgenus *Infraparkinsonia* WESTERMANN (1956a, p. 268). Specifically dimorphous counterparts of the individual *Caumontisphinctes* and *Infraparkinsonia* are well-controlled both morphologically and stratigraphically (cf. PAVIA 1972, text-fig. 6).

Caumontisphinctes polygyralis BUCKMAN, 1920

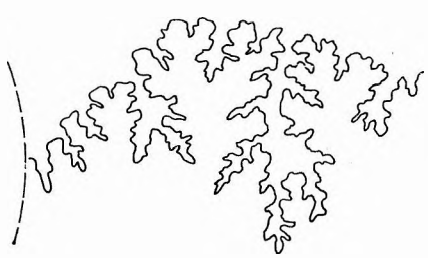
Pl. XX, figs. 2—3, Text-fig. 71

1920. *Caumontisphinctes polygyralis* nov. — BUCKMAN (1909—30), pl. 163.
1943. *Caumontisphinctes polygyralis* BUCKMAN — ROCHÉ, p. 22, pl. I, fig. 4.
1969. *Caumontisphinctes polygyralis* BUCKM. — PAVIA, p. 447, figs. 3—7.
1970. *Caumontisphinctes* sp. — GALÁCZ, p. 118.
1971. *Caumontisphinctes polygyralis* BUCKMAN — STURANI, p. 165, pl. 16, fig. 19.
1972. *Caumontisphinctes (C.) polygyralis* S. BUCKMAN — PAVIA, p. 116, pl. 22, fig. 1.

Material: Two fragmentary specimens with a preserved shell and one with a well-preserved internal mould.

Dimensions: J9383: 57; 17 (30); 13 (23); 29 (51)

Description: The figured, nearly complete specimen is a small-sized, internal mould. The umbilicus is wide, the whorl-section is elliptically-shaped, with a low umbilical slope, a rounded umbilical edge, flattened whorl-sides, and a low, arched venter. The ribbing is shown better on an other specimen with test (Pl. XX, fig. 2). The dense, sharp, straight, prorsiradiate primary ribs arise at the umbilical edge and bifurcate just above the middle of the flanks. Simple ribs also occur. Because of the poor preservation, the venter cannot be studied. The small lateral tubercules mentioned in earlier descriptions (BUCKMAN 1909—30, STURANI 1971, PAVIA 1972) cannot be seen, either. The ribbing on the cast is much more simple, i.e. the secondaries tend to fade on the last whorl. The last half whorl of the shelled specimen bears 30 primary and 57 secondary ribs. All the available specimens lack the apertural part and the sutures are invisible.



Text-fig. 71. Suture-line of *Caumontisphinctes polygyralis* (J9383), VI/16, Subfurcatum and Garantiana Z.

Remarks: As was recognized by STURANI (1971) and PAVIA (1972), the main distinguishing feature of the species *C. polygyralis* is its dense ribbing. Despite the poor state of preservation, the Gyenespuszta specimens are in good agreement with the type figure.

Distribution: *C. polygyralis* has been described from both the NW European and Mediterranean regions. It is a stratigraphically important form, having been selected by PAVIA and STURANI (1968, p. 313) as index form of one of the subzones of the Subfurcatum Zone. The Gyenespuszta specimens occur in Bed 16 of Profile VI (i.e. Subfurcatum and Garantiana Zones).

Genus PARKINSONIA Bayle, 1878

Type species: *Am. parkinsoni* Sowerby (1821), designated by Douvillé (1879, p. 91). The first photograph of the lectotype was figured by Arkell (1951—59, text-fig. 53).

General remarks: The great *Parkinsonia* genus, with its several subgenera, is undoubtedly of polyphyletic origin, arising from different Bajocian forms. Some species can be derived from the *Garantiana*, *Caumontisphinctes* genera, others from the Morphoceratidae. The first representatives of *Parkinsonia* s.s. appear in the basal Parkinsoni Zone. These are evolute forms (e.g. *P. acris*, *P. rarecostata*) which closely resemble the *Caumontisphinctes* of the Subfurcatum Zone, the differences consist in sharper ribbing and the lack of constrictions. On the other hand, the stratigraphic hiatus spanning one zone and a half between the two genera suggests the possibility of further transitional forms to be discovered. After showing a great frequency in the Parkinsoni and Zigzag zones, the genus disappears abruptly, its last representatives occurring in the Macrescens Subzone. Arkell (1951—59, pp. 143, 150, 156, 239) recorded parkinsoniids (incl. *Parkinsonia* s.s.) from the upper Middle Bathonian, but these records were based on misidentifications (see Sturani 1966, p. 34). Another, problematic, parkinsoniid is "*Parkinsonia*" *calloviensis* Lóczy (1915, p. 125, pl. IV, fig. 11, pl. VI, fig. 11, text-fig. 88) from the Callovian ammonite-rich bank of the Villány Mts. (Southern Hungary). Spath (1927—33, p. 253) regarded this form as a mixed Bathonian specimen in the Callovian collection. This possibility cannot be precluded (see the example of *Cadomites exstinctus*, above). On the other hand, the matrix of the original suggests a Callovian age, and in this case the range into the Lower Callovian *Epimorphoceras* genus seems to be more likely.

Distribution: The vertical range of *Parkinsonia* s.s. extends from basal Parkinsoni to upper Zigzag Zones. Its species appear both in the Mediterranean and NW European areas. In this latter region some localities yield mass occurrences, while in the Mediterranean faunas the genus is rather subordinately represented. Consequently, *Parkinsonia* seems to be a NW European form, with frequent Mediterranean invaders.

Dimorphism: The large group of *Parkinsonia* and its subgenera apparently resist the demonstration of dimorphic pairs (see Hahn 1970, p. 15). The forms previously regarded as lappetted parkinsoniids proved to belong into other groups. Thus the lappetted *Am. parkinsoni planulatus* (Quenstedt, 1886—87, pl. 71, fig. 16) turned out to be a *Siemiradzkia* (Hahn 1969, p. 44). Arkell (1951—59, pl. XIX, figs. 7a-b) figured, under the name *P. (P.) dorni*, a microconch form, but it proved to be a perisphinctid (Torrens 1969, p. 321). The only true auriculate *Parkinsonia* was figured by Wetzel (1911, pl. XV, fig. 1) as *Parkinsonia subarietis*. It is interesting, that the first figure of this species (d'Orbigny 1842—51, pl. 122, fig. 1) also shows a specimen with short lateral lappets.

These one or two examples, however, are insignificant compared to the bulk of macroconchiate *Parkinsonia*. The demonstration of the dimorphism, if any, should be preceded by a phylogenetic revision of the existing, strictly morphological, taxonomy of the parkinsoniids (cf. Sturani 1966, p. 20).

Parkinsonia (Parkinsonia) rarecostata (Buckman, 1881)

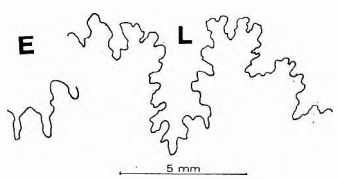
Pl. XX, fig. 4, Text-fig. 72

1846. *Ammonites Parkinsoni* — d'Orbigny (1842—51), p. 347, pl. 122, figs. 1—2 (only).
1858. *Ammonites Parkinsoni depressus* — Quenstedt, p. 472, pl. 63, fig. 9.
1881. *Cosmoceras Parkinsoni* var. *rarecostata* — Buckman, p. 599.
1887. *Ammonites Parkinsoni planulatus* — Quenstedt (1886—87), p. 599, pl. 71, fig. 21 (only).
1887. *Ammonites Parkinsoni* — Quenstedt (1886—87), p. 605, pl. 72, fig. 11 (only).
1888. *Parkinsonia Parkinsoni* Sowerby sp. 1821 — Schlippe, p. 207, pl. IV, figs. 5a-b (only).
1911. *Parkinsonia Schlippei* sp. nov. — Rollier, p. 297.
1911. *Parkinsonia subarietis* n. sp. — Wetzel, p. 187, pl. XIII, figs. 18—19, pl. XIV, figs. 1—8, pl. XV, figs. 1—2.
1911. *Parkinsonia d'Orbignyana* n. sp. — Wetzel, p. 196, pl. XVI, fig. 1.
1912. *Parkinsonia rarecostata* Buckman — Roman—Gennevaux, p. 95, pl. III, fig. 10.
1919. *Parkinsonia Schlippei* Rollier — de Grossouvre, p. 377, text-fig. 2.
1921. *Parkinsonia rarecostata* Buckman — Riche—Roman, p. 145, pl. VI, fig. 7.
1922. *Parkinsonia rarecostata* S. Buckman sp. — Buckman (1909—30), pl. 352.
1927. *Parkinsonia subarietis* Wetzel — Nicolesco (1927—28), p. 23, pl. I, figs. 12—17, pl. II, fig. 1, text-fig. 9.
1927. *Parkinsonia Orbignyana* Wetzel — Nicolesco (1927—28), p. 27, pl. III, figs. 2—5 (only).
non 1928. *Parkinsonia* gr. de *rarecostata* Buck. — Sayn—Roman, p. 53, pl. V, fig. 4.
1931. *Parkinsonia subarietis* Wetzel — Schmidtill—Krumbeck, p. 860, pl. 82, fig. 7.
1931. *Parkinsonia* cfr. *orbignyana* Wetzel — Schmidtill—Krumbeck, p. 866, pl. 83, fig. 4.
1935. *Parkinsonia* cf. *subarietis* Wetz. — Bircher, p. 149, pl. X, figs. 7—8, text-fig. 23.
1935. *Parkinsonia subarietis* Wetzel — Roman, p. 21, pl. II, fig. 6.
1937. *Parkinsonia orbignyana* We. — Wetzel, p. 119, pl. XII, figs. 5a-c.
?1956. *Parkinsonia subarietis* Wetzel — Kakhadze—Zesashvili, p. 40, pl. VII, fig. 10.

1956. *Parkinsonia orbignyana* Wetz. — Kakhadze—Zesashvili, p. 41, pl. VIII, fig. 1.
non 1963. *Parkinsonia orbignyana* Wetz. — Zesashvili, p. 27, pl. I, fig. 5, pl. III, figs. 3a-b.
1969. *Parkinsonia pseudoparkinsoni* Wetzel — Mihajlović, p. 80, pl. XVI, fig. 1, pl. XVII, fig. 1.
1970. *Parkinsonia rarecostata* Buckman — Galácz, p. 119.
non 1972. *Parkinsonia subarietis* Wetzel, 1911 — Ammaniazov, p. 13, pl. I, fig. 4, pl. IX, fig. 3, pl. X, fig. 2.
non 1972. *Parkinsonia orbignyana* Wetzel, 1911 — Ammaniazov, p. 15, pl. II, figs. 1a-b, pl. IX, fig. 8, pl. X, fig. 3.
1972. *Parkinsonia (P.) rarecostata* S. Buckman — Pavia, p. 119, pl. 25, fig. 1.
?1975. *Parkinsonia* ex gr. *rarecostata* Buckman 1881 — Kutuzova, p. 85, pl. XXV, figs. 3a-b.
1976. *Parkinsonia subarietis* Wetzel — Wormbs, pl. IV, figs. 3—4.

Material: A single internal mould.
Dimensions: J9387: 53; 14 (26.5); 12 (22.5); 28 (53)

Description: Relatively well-preserved specimen with a rather wide and shallow umbilicus. The umbilical wall is low, the whorl-sides are flattened and round into the narrow, depressed venter. The venter bears a slightly impressed smooth band. The whorl-section is quadrate, with rounded edges, the maximal width lies at the umbilical edge. The sharp, straight, somewhat prorsiradiate primary ribs arise from the umbilical edge and bifurcate into secondaries near the ventrolateral margin. The secondary ribs end abruptly on the venter and alternate on the sides of the ventral smooth band. Several primaries attain the venter as single ribs, and some intercalatories appear at the row of the bifurcation points. At 42 mm diameter a half-whorl bears 20 primary and 29 secondary ribs. The specimen is a phragmocone fragment, lacking the body-chamber and the aperture.



Text-fig. 72. Suture-line of *Parkinsonia (P.) rarecostata* (J9387), VI/15, Parkinsoni Z.

The suture-line is simple with short and wide E and somewhat deeper and symmetric L. The ES is wide and less-divided, LS is similarly high and simple (Text-fig. 72).

Remarks: *P. rarecostata* is distinguished by its evolute coiling, quadrate whorl-section and strong, sharp, widely-spaced ribbing. At the furcation points tiny tubercules appear commonly, but in the Gyenespuszta specimen this feature—because of its internal mould nature—is invisible. The species was based by Buckman (1881, p. 599) on figs. 1 and 2 in plate 122 of d'Orbigny (1842—51). Later Wetzel (1911, p. 196) based his *P. orbignyana* on these same figures, therefore this latter name is an objective synonym of *P. rarecostata* (see Arkell 1951—59, p. 148 and Pavia 1972, p. 120). On the other hand, the type of the species *P. subarietis* Wetzel (1911, pl. XIII, figs. 18—19) agrees in its characters with *P. rarecostata*, thus it is also a synonym (see Sturani 1964b, p. 26 and Pavia 1972, p. 120). Wetzel (1911, p. 187) included in the synonymy of his *P. subarietis* the form figured on pl. 4, fig. 5 by Schlippe (1888). On this same figure, again in the year 1911, Rollier founded (p. 297) a new species with the name *Parkinsonia Schlippei*. Accordingly, this latter species should also be taken to be a synonym of *P. rarecostata*.

Wetzel (loc. cit.), under the name *P. subarietis*, figured several specimens. Among these forms the specimen on pl. XV, fig. 1 shows lappets at about 90 mm diameter. Another figured form (pl. XIV, fig. 7) is a body-chamber of a large specimen, septate at about 135 mm, and shows the adult peristome with the base of the lappets. The base of the lateral lappet is similarly visible on the adult specimen figured by Nicolesco (1927—28), on his pl. II, fig. 1a. On the basis of these figures *P. rarecostata* is a species of variable size with an auriculate, "microconchiate" peristome.

Distribution: *P. rarecostata* is a species of common record from both the NW European and Mediterranean regions. Its stratigraphical range is confined to the Parkinsoni Zone of the Upper Bajocian. The Gyenespuszta specimen has come from this same zone, from Bed 15 of Profile VI.

Parkinsonia (Parkinsonia) sp.

Pl. XXI, fig. 1

1928. *Durotrigensia parkinsoni* J. Sowerby sp. 1821 — Buckman (1909—30), pl. 78A-C.
1970. *Parkinsonia parkinsoni* (Buckman non Sow.) — Galácz, p. 119.

Material: A single poorly preserved internal mould.
Dimensions: J9388: 145; 47 (32); ?38 (?26); 62 (43)

Description: Relatively large, fragmentary specimen with a moderately wide and shallow umbilicus, a convex umbilical wall and a rounded umbilical margin. The whorl-sides are convex, the ventrolateral edge is rounded. The whorl-section is high-oval, with its maximal width at the lower third of the whorl-height. The slightly prorsiradiate primary ribs arise at the umbilical margin. The primary ribs bifurcate at the upper third of the whorl-height. The primaries get coarser on the body-

chamber. The last half whorl bears 26 primary and about 50 secondary ribs. Because of the poor preservation of this specimen, the phragmocone and the body-chamber cannot be separated. Apertural part broken, no suture-lines visible.

Remarks: The specimen here described and figured shows closest resemblance to the original of "*Durotrigensia parkinsoni*" of BUCKMAN (1909—30, pls. 781A-C). This form is distinguished by its coarser and rather prorsiradiate primary ribs and more rounded whorl-section from the lectotype of *Parkinsonia (P.) parkinsoni* (SOWERBY). Whether we have to do with a new species cannot be decided, given the single, poorly preserved and fragmentary specimen available.

Distribution: The specimen of BUCKMAN is derived from the Parkinsoni Zone of Dorset (Southern England). The Gyenespuszta specimen has come from the lower part of the Parkinsoni Zone (Bed 15 of Profile VI).

Parkinsonia (Parkinsonia) parkinsoni (SOWERBY, 1821)

Pl. XX, fig. 5, Text-figs. 73, 74

	1821.	*Ammonites Parkinsoni* SOW. — SOWERBY (1812—1829), p. 342, pl. 307, fig. 1.
non	1878.	*Parkinsonia Parkinsoni* SOWERBY sp. — BAYLE, pl. LXVII, figs. 2—3.
	1881.	*Cosmoceras Parkinsoni* SOW. sp. — BÖCKH, p. 61, pl. V, figs. 2a-b.
non	1888.	*Parkinsonia Parkinsoni* SOWERBY sp. — SCHLIPPE, p. 207, pl. IV, figs. 1, 3, 5.
	1888.	*Parkinsonia ferruginea* OPP. sp. — SCHLIPPE, p. 211, pl. VI, fig. 2.
	1908.	*Ammonites parkinsoni* — BUCKMAN and SECR., pl. VI, figs. a-c.
non	1909.	*Parkinsonia Parkinsoni* SOWERBY — LISSAJOUS (1907—12), p. 330, pl. 6, fig. 6.
non	1911.	*Parkinsonia Parkinsoni* SOW. sp. 1821 — WETZEL, p. 198, pl. XVI, fig. 3.
	1911.	*Parkinsonia pseudoparkinsoni* n. sp. — WETZEL, p. 200, pl. XVI, figs. 4—6.
	1914.	*Parkinsonia Parkinsoni* SOWERBY typus — ZATWORNITZKY, p. 551, pl. XVII, figs. 18—19.
	1927.	*Parkinsonia Parkinsoni* SOWERBY — NICOLESCO (1927—28), p. 30, pl. VI, figs. 3—13, pl. VI, figs. 1—4, pl. VIII, figs. 1—2, text-fig. 32.
	1927.	*Parkinsonia Parkinsoni* SOW. var. *pseudoparkinsoni* WETZ. emend NICOLESCO — NICOLESCO (1927—28), p. 33, pl. V, figs. 3—6, pl. VI, figs. 1—2, text-fig. 12.
	?1927.	*Parkinsonia Parkinsoni* SOWERBY — ROMAN—PÉTOURAUD, p. 42, pl. VI, fig. 22.
	1927.	*Parkinsonia Parkinsoni* SOW. — DORN, p. 234, pl. 4, figs. 8a-b (only).
non	1928.	*Durotrigensia parkinsoni* J. SOWERBY sp. 1921 — BUCKMAN (1909—30), pls. 781A-C.
	1931.	*Parkinsonia parkinsoni* SOW. — SCHMIDTILL—KRUMBECK, p. 867, pl. 87, figs. 1—2, pl. 85, fig. 1, pl. 86, fig. 7 (only).
non	1931.	*Parkinsonia pseudoparkinsoni* WETZEL — SCHMIDTILL—KRUMBECK, p. 869, pl. 85, fig. 3, pl. 86, figs. 3a-b, pl. 87, fig. 4.
	1951.	*Parkinsonia parkinsoni* SOWERBY var. *pseudoparkinsoni* WETZEL 1911 — MAUBEUGE, p. 93, pl. XV, fig. 6.
	1956.	*Parkinsonia (Parkinsonia) parkinsoni* (J. SOWERBY) — ARKELL (1951—59), p. 143, text-fig. 53.
non	1957.	*Parkinsonia parkinsoni* SOWERBY — THÉOBALD—BOURQUIN, p. 44, pl. II, figs. 1, 3.
non	1959.	*Parkinsonia parkinsoni* SOWERBY — ENTSCHEWA, p. 116, pl. VII, figs. 2a-b.
non	1961.	*Parkinsonia pseudoparkinsoni* WETZEL — MAUBEUGE, p. 152.
	1963.	*Parkinsonia parkinsoni* (SOWERBY) — AZARIAN, p. 209, pl. XII, figs. 3—4.
	?1963.	*Parkinsonia parkinsoni* SOW. — ZESASHVILI, p. 27, pl. II, fig. 10.
	1964a.	*Parkinsonia parkinsoni* (SOW.) — STURANI, p. 37, pl. VI, fig. 2.
	1964b.	*Parkinsonia parkinsoni* (SOWERBY) — STURANI, p. 26, pl. III, fig. 2.
non	1969.	*Parkinsonia pseudoparkinsoni* WETZEL — MIHAJLOVIĆ, p. 80, pl. XVI, fig. 1, pl. XVII, fig. 1.
	1970.	*Parkinsonia parkinsoni* (SOW.) — GALÁCZ, p. 119.
	1972.	*Parkinsonia parkinsoni* SOWERBY, 1821 — AMMANIAZOV, p. 23, pl. VI, figs. 1a-b, pl. IX, fig. 7, pl. X, fig. 4.
non	1972.	*Parkinsonia pseudoparkinsoni* WETZEL, 1911 — AMMANIAZOV, p. 24, pl. VII, fig. 1, pl. X, fig. 5.

Material: Three, partly fragmentary specimens.
Dimensions: J9385: 89; 27 (30); 26 (29); 38 (43)
J9386: 94; 31 (33); 24 (25.5); 43 (46)

Description: The specimen figured here is an internal mould, partly fragmentary, but well-preserved. The umbilicus is wide, shallow, the umbilical wall is convex, with a rounded umbilical margin. The flattened, slightly divergent whorl-sides and the narrow, depressed venter meet in somewhat rounded ventrolateral edges. The ventral sulcus is well-marked, but not deeply compressed. The sharp, straight, slightly projected primary ribs arise from the umbilical margin, and, high on the flanks, near the ventrolateral edge, they bifurcate into strongly prorsiradiate secondaries. There are some simple primaries and some intercalatories, appearing in the row of bifurcation. The secondary ribs end abruptly on the venter, being arranged alternately on the two sides of the sulcus. At 94 mm diameter the half-whorl bears 26 primary ribs. Septation ceases at about 115 mm diameter. Aperture not preserved.

The septal sutures (Text-fig. 74) are typical of *Parkinsonia*, with broad saddles and a long, typically trifid first lateral lobe. On another specimen from Gyenespuszta (No. J9386) the ribbing is somewhat denser, at 96 mm diameter one half-whorl bears 28 primary and 50 secondary ribs.

Remarks: *Parkinsonia parkinsoni* is one of the most frequently cited and recorded Upper Bajocian ammonite species. This can be due—beside the actually wide geographic distribution—to its great stratigraphic importance.

The first authentic, photographic figures of the lectotype have been published by ARKELL (1951—59, text-fig. 53). On the basis of these photographs, *P. parkinsoni* is distinguished from the other congeneric forms by its wide umbilicus, flattened whorl-sides, narrow venter, straight primary ribs and the almost ventrolateral bifurcation points. As was shown by NICOLESCO (1927—28, p. 30), *P. pseudoparkinsoni* is a synonym, having been based by WETZEL (1911, p. 200) on one of the "*P. ferruginea*" figures of SCHLIPPE (1888, pl. 6, fig. 2), which is conspecific with the type of SOWERBY.

Text-fig. 73. Whorl-section of *Parkinsonia (P.) parkinsoni* (J9386), VI/13, Parkinsoni Z.

Text-fig. 74. Suture-line of *Parkinsonia (P.) parkinsoni* (J9385), I, Parkinsoni Z.

From the numerous *P. parkinsoni* figures of the earlier literature, those published by BAYLE (1878, pl. LXVII, figs. 2—3) should be excluded, being the type of *Parkinsonia typus* of BUCKMAN (1909—30, pl. 789). The forms figured by SCHLIPPE under the name *P. parkinsoni* also differ from the type. According to STURANI (1966, p. 32), the form figured on pl. IV, figs. 1, 1a, is a *P. subplanulata* WETZEL. Pl. IV, fig. 3 of SCHLIPPE shows a specimen with relatively more widely spaced ribbing and rounded whorl-section, approaching *P. schloenbachi* (SCHLIPPE). As pointed out by WETZEL (1911, p. 187), the original of pl. IV, figs. 5, 5a can be assigned to his *P. subarietis*, i.e. to *P. rarecostata* (BUCKMAN) (see above). LISSAJOUS (1907—12, pl. 6, fig. 6) figured, as *P. parkinsoni*, a form with rounded whorls and fewer primary ribs. On the basis of the curved, blunter ribs and centrally situated bifurcation points, the specimen figured by WETZEL (1911, pl. XVI, fig. 3) similarly to the case of "*Durotrigensia parkinsoni*" of BUCKMAN (1909—30, pls. 781A-C), probably belongs to an unnamed species (see above at *Parkinsonia* sp.). The nucleus figured by ROMAN and PÉTOURAUD (1927, pl. VI, figs. 22, 22a) is somewhat more evolute and more densely ribbed than those figured by NICOLESCO (1927—28, pl. V, fig. 3 and pl. VI, figs. 3—4). DORN (1927) figured two specimens as *Parkinsonia parkinsoni*, of which that on pl. 5, fig. 2 shows a narrow umbilicus and curved ribbing, differing from the type. Under the names *P. parkinsoni* and *P. pseudoparkinsoni* several specimens were figured by SCHMIDTILL and KRUMBECK (1931), but only some of these figures present true *P. parkinsoni* examples (for discussions see STURANI 1964b, p. 26). In the case of one of the two specimens figured by THÉOBALD and BOURQUIN (1957), the body-chamber fragment on pl. II, fig. 3 seems to belong to the *P. neuffensis* (OPPEL) group. The smaller form (pl. II, fig. 1) shows a wide umbilicus and widely-spaced ribbing, but the closer identification of the figure is impossible. The specimen of ENTSCHEWA (1959, pl. VII, figs. 2a-b) has dense, strongly projected ribbing with long outer ribs, and these features resemble those of *P. densicosta* (QUENSTEDT). The narrow umbilicus and the broad, rounded cross-section of MAUBEUGE's *P. pseudoparkinsoni* (1951, p. 152) preclude an identity with *P. parkinsoni*. The specimen of MIHAJLOVIČ (1969, pl. XVI, fig. 1, pl. XVII, fig. 1) with a wide umbilicus and a furcation of the ribs on the ventrolateral margin is a typical *P. rarecostata*. The fragmentary *P. pseudoparkinsoni*

specimen of AMMANIAZOV (1972, pl. VII, fig. 1, pl. X, fig. 5), with its arched ribs and different suture-line, differs from *P. parkinsoni*.

Distribution: This important zonal index fossil occurs in NW European and Mediterranean localities. At Gyenespuszta the specimens have been collected from Bed 13 of Profile VI and from Profile I (Parkinsoni Zone).

Parkinsonia (Parkinsonia) cf. **subtilis** ARKELL, 1956

Pl. XXI, fig. 5

1956. *Parkinsonia (Parkinsonia?) subtilis* sp. nov. — ARKELL (1951—59), p. 152, pl. XVIII, figs. 6a-c, text-fig. 57/4.

Material: A single, incomplete, subsoluted specimen.
Dimensions: J9389: 117; 33 (28); ?24 (?22); 57 (48.5)

Description: An evolute form of medium size with an oblique and convex umbilical wall and a rounded umbilical margin. The convergent whorl-sides are somewhat flattened, with a slight spiral depression at the outer third of the flanks. The ventrolateral shoulder is rounded, the venter is low and somewhat flattened. The whorl-section is trapezoidal, with its maximum thickness at the umbilical edge. Because of the poor state of preservation, the ribbing is hardly visible. The closely-spaced, biplicate ribs are radial, but slightly arched forward at the end of the body-chamber. The outer ribs cannot be seen on the worn venter. The preserved 6/7 part of the last whorl is the body-chamber. Near the aperture the body-chamber shows a slight contraction. The peristome is simple, without lappets. Sutures not seen.

Remarks: The species *Parkinsonia subtilis* differs from all the congeneric forms known from the Lower Bathonian in having an extremely evolute coiling, dense ribbing and non-impressed ventral smooth band. The Gyenespuszta specimen, in spite of its poor state of preservation, agrees well with the holotype. Similarities are the evolute coiling, the fine and dense ribbing and the features of the aperture. On the other hand, it differs by its size, as the holotype is 74 mm in diameter with a body-chamber constituting 5/8 of a whorl, whereas the Gyenespuszta specimen is 117 mm, with a body-chamber of 6/7 of a whorl. However, it is probably the same species though the poor preservation allows just a vague determination.

Distribution: The holotype came from the Crackment Limestone of Somerset (Southern England), i.e. from the middle part of the Zigzag Zone (TORRENS 1969a, p. A.20). *Parkinsonia* aff. *subtilis* was recorded also from the Lower Bathonian of the southern Jura Mountains by MANGOLD et al. (1964, p. 530). The Gyenespuszta specimen of this rare species was yielded by Bed 9 (Zigzag Zone) of Profile VI.

Familia **Spiroceratidae** HYATT, 1900

Genus SPIROCERAS QUENSTEDT, 1858

Type species: *Hamites bifurcati* QUENSTEDT 1843, the lectotype (QUENSTEDT 1845—49, pl. 11, fig. 14), was designated by ARKELL (1957, p. L206).

General remarks: ARKELL (1957, pp. L205—L206) regarded the Middle Jurassic heteromorphous ammonites (family Spiroceratidae) as descendants of Lytoceratina, on the basis of the presence of the Lower Jurassic *Arcuceras*. On the other hand, he emphasized that there was great resemblance to the early Parkinsoniidae, particularly to the *Strenoceras*. Subsequently, it was cleared, that the Pliensbachian *Arcuceras* was not an ammonite (DONOVAN and HÖLDER, 1958), thus the earlier opinions (cf. SCHINDEWOLF 1951, 1953; WESTERMANN 1956) about the perisphinctid arrangement of the Spiroceratidae became justified.

The origin of Spiroceratidae is still problematic. The earliest *Spiroceras (S. bifurcati)* appears in the Baculatum Subzone of the Subfurcatum Zone, somewhat later than the genus *Strenoceras* (PAVIA 1972). This fact seems to prove the suggestion of SCHINDEWOLF, who regarded *Spiroceras* as a specialized off-shoot of *Strenoceras*. On the other hand, the morphology and the suture-line of the two genera show so significant differences even in this early stage (cf. WIEDMANN 1969), that a direct connection is hardly possible. OCHOTERENA (1966) regarded *Parastrenoceras* as ancestral form of the Spiroceratidae, but STURANI (1971, p. 169) demonstrated, that these two groups were rather parallel lineages of probably common origin.

At the present stage of knowledge the Middle and Upper Jurassic heteromorphous ammonites consist of 6 genera:

Spiroceras QUENSTEDT, 1858
Parapatoceras SPATH, 1924
Infrapatoceras OCHOTERENA, 1966
Metapatoceras SCHINDEWOLF, 1963
Paracuarites SCHINDEWOLF, 1963
Acuarites SCHINDEWOLF, 1963

The two latter Callovian genera were included by SCHINDEWOLF (1963) in the family Acuariceratidae, and he regarded them, in contrast to the Spiroceratidae, as separate off-shoots from Lytoceratina. According to WIEDMANN (1969), the Jurassic heteromorphs form a single, monophyletic unit, which disappeared at the end of the Oxfordian, without leaving descendants.

D i s t r i b u t i o n : Recently, DIETL (1973) has summarized the geographic distribution of the Middle Jurassic heteromorphs, and this synthesis concludes that the Spiroceratidae family comprises mainly Mediterranean forms, with some NW European occurrences. Most common genus is the Upper Bajocian *Spiroceras* (synonym: *Apsorroceras* HYATT, 1900, see STURANI 1971, p. 170). The stratigraphic range of this genus is quoted erroneously in numerous references (e.g. OCHOTERENA 1966, text-fig. 6; WIEDMANN 1969, text-fig. 5). All the known species of *Spiroceras* came from the Upper Bajocian, and the records of Bathonian heteromorphs seem to refer to *Parapatoceras*, which is unquestionably documented now by a Zigzag Zone occurrence in this Gyenespuszta fauna (see below).

D i m o r p h i s m : As microconch pairs of the Bajocian macroconchiate representatives of the Spiroceratidae, the genera *Strenoceras* and *Pseudogarantiana* were suggested by STURANI (1966, pp. 19—20). Subsequently, on morphological grounds, he abandoned this view (STURANI 1971, p. 169). This pairing, undoubtedly, cannot be proved either morphologically, or stratigraphically.

The demonstration of dimorphism in heteromorph ammonites is still an open question. MAKOWSKI (1963, pp. 31—34) studied the dimorphism of *Scaphites*, a Cretaceous heteromorph, and suggested the possibility of infraspecific matches. Subsequently COBBAN (1969) treated the dimorphism of *Scaphites*, and proved practically the suggestions of MAKOWSKI. The dimorphism he documented by differences in the coiling and dimensions cannot be regarded as general criteria for all heteromorphs. Additionally, the Jurassic Spiroceratidae unite a far more variable group as compared to the *Scaphites* of relatively stable morphology.

Spiroceras bifurcati (QUENSTEDT, 1843)

Pl. XXI, fig. 4, Text-figs. 75, 76

1843. *Toxoceras aequalicostatus* — BAUGIER—SAUZÉ, p. 132, pl. II, figs. 4—7.
1843. *Ancyloceras bispinatus* — BAUGIER—SAUZÉ, p. 136, pl. III, figs. 4—5 (only).
1843. *Helicoceras Teilleuxi* — BAUGIER—SAUZÉ, p. 139, pl. III, figs. 11—16.
1849. *Ancyloceras subannulatus* D'ORB. — D'ORBIGNY (1842—51), p. 579, pl. 225, figs. 12—15.
1849. *Hamites bifurcati* — QUENSTEDT (1849—51), p. 150, pl. 11, fig. 15.
1858. *Hamites bifurcati* — QUENSTEDT, p. 404, pl. 55, figs. 1—3, 6—12 (only).
1887. *Hamites baculatus* — QUENSTEDT (1886—87), p. 579, pl. 70, fig. 15 (only).
1887. *Hamites bifurcati* — QUENSTEDT (1886—87), p. 585, pl. 70, figs. 27, 29—44 (only).
?1916. *Ancyloceras tenue* D'ORBIGNY — DOUVILLÉ, p. 26, pl. III, figs. 10—14.
1923. *Patoceras dertusanum* n. sp. — FALLOT—BLANCHET, p. 130, pl. III, figs. 11—13.
1927. *Spiroceras bispinatum* BAUGIER et SAUZÉ — ROMAN—PÉTOURAUD, p. 31, pl. III, figs. 13—20, pl. IV, figs. 1—13.
1929. *Spiroceras bifurcatum* QUENSTEDT (cum var. *dertusanum*, *althoffi;* forma *telleuxi*, *curvatum*) — POTONIÉ, pp. 230—238, pl. 17, figs. 4—18.
1935. *Spiroceras bifurcatum* QUENST. — BIRCHER, p. 166, pl. XII, figs. 4—6, text-figs. 30—31.
1970. *Spiroceras bifurcatum* (QUENSTEDT) — IMLAY, p. D10, pl. 1, figs. 1—6.
1970. *Spiroceras bifurcatum* (QUENST.) — GALÁCZ, p. 117.
1972. *Spiroceras bifurcati bifurcati* (QUENSTEDT) — PAVIA, p. 124, pl. 22, fig. 3, pl. 23, fig. 4, pl. 24, figs. 2, 4—5.
1974. *Spiroceras aequalicostatus* (BAUGIER et SAUZÉ) — DIETL, p. 10, pl. 1, fig. 1.
1975. *Spiroceras* cf. *S. bifurcati* (QUENSTEDT) — WESTERMANN, p. 45, pl. 2, fig. 9.

M a t e r i a l : Three fragmentary internal moulds.

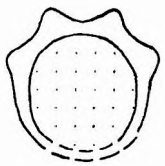
D e s c r i p t i o n : The figured specimen is a 5.5 cm long, relatively well-preserved, slightly curved fragment. The whorl-section (Text-fig. 75) is slightly compressed, with its maximal width at the half-height of the flanks. The ribbing is simple. The sharp and high ribs, slightly rectiradiate, straight or curved, arise from the umbilical wall. The height of the ribs is greater towards the venter and the ribs bear two tubercules: one above the upper third of the flank and another at the ventrolat-

eral edge. The ventrolateral tubercules are higher and more acute than the lateral ones. The ribs are discontinuous on the venter; here a ventral furrow is visible.

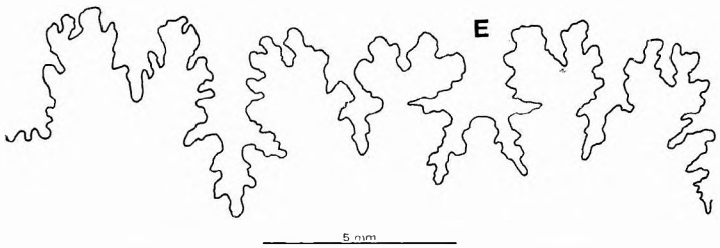
In the available specimens the body-chamber is fragmentary, lacking the peristome. One Gyenespuszta specimen, which is a densely-ribbed body-chamber fragment, agrees well with that figured by PAVIA (1972, pl. 24, fig. 5).

The suture-line (Text-fig. 76) is relatively simple. E is narrow, L is short, slightly directed outward. U_2 is wide, three-pronged, symmetrical, deeper as E. The saddles are less divided, of equal height.

R e m a r k s : The species *S. bifurcati* is distinguished from the congeneric forms by its smaller size, slender build-up, widely-spaced ribbing, spinous ventrolateral tubercules and sulcate venter.



Text-fig. 75. Whorl-section of *Spiroceras bifurcati* (J9390), VI/17, Subfurcatum Z.



Text-fig. 76. Suture-line of *Spiroceras bifurcati* (J9390), VI/17, Subfurcatum Z.

Liek the other heteromorphous ammonites, it is a highly variable form. The younger whorls (i.e. the fossil phragmocones) bear a stable style of ribbing, variability being manifested in the grade of uncoiling. On the other hand, the ribbing of the body-chamber is more variable: forms with feeble, widely-spaced and weakly tuberculate ribs, and densely-ribbed forms occur (see the figures of PAVIA 1972). On the basis of this variability, the inclusion of POTONIÉ's varieties (1929) in this species seems to be justified. *S. aequalicostatus* (BAUGIER et SAUZÉ, 1843, see DIETL 1974, pl. 1, fig. 1) is similarly a synonym. As was previously suggested by ARKELL (1956, p. 291), the form described as "*Ancyloceras tenue*" from the Bajocian of the Middle East by DOUVILLÉ (1916, pl. III, figs. 10—14) also seems to belong here.

D i s t r i b u t i o n : *S. bifurcati* is a species of wide distribution within both the NW European and Mediterranean realms. In Germany it occurs in the Subfurcatum Zone (Strenoceras Horizon, POTONIÉ 1929, p. 223), in SE France it ranges from the Subfurcatum to the lower Garantiana Zone (PAVIA 1972, p. 125). At Gyenespuszta it occurs in Beds 17 and 16 of Profile VI, i.e. in the Subfurcatum and Garantiana Zones.

Spiroceras baculatum (QUENSTEDT, 1858)

Pl. XXI, figs. 2—3, Text-figs. 77, 78

1858. *Hamites baculatus* — QUENSTEDT, p. 403, pl. 72, fig. 4.
1881. *Ancyloceras baculatum* QUENST. sp. — BÖCKH, p. 65, pl. II, fig. 6, pl. III, fig. 1 (only).
1887. *Hamites baculatus* — QUENSTEDT (1886—87), p. 577, pl. 70, figs. 12—14 (only).
1923. *Rhabdodites rhabdodes* nov. — BUCKMAN (1909—30), pl. 374.
1929. *Apsorroceras baculatum* QUENSTEDT sp. — POTONIÉ, p. 227, pl. 17, figs. 1—2.
1935. *Apsorroceras baculatum* QUENSTEDT — BIRCHER, p. 169, pl. XII, fig. 7, text-fig. 33.
1963. *Apsorroceras baculatum* (QUENSTEDT) — NAGY, p. 167, pl. I, figs. 1—2.
1970. *Apsorroceras baculatum* (QUENST.) — GALÁCZ, p. 118.
1972. *Spiroceras baculatum* (QUENSTEDT) — PAVIA, p. 125, pl. 24, fig. 3.

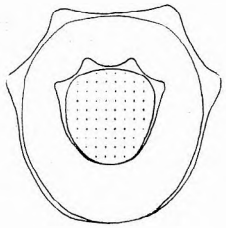
M a t e r i a l : 3 larger and about 30 smaller, fragmentary internal moulds.

D e s c r i p t i o n : The largest, relatively well-preserved specimen (Pl. XXI, fig. 3) is a 15.5-cm-long internal mould, both the phragmocone and the body-chamber are fragmentarily preserved. It is a straight ammonite, the other specimens are also straight or slightly curved. The cross-section (Text-fig. 77) is circular, somewhat compressed laterally. Maximal width near the middle of the flanks. The ribbing of the internal cast is variable. Over the juvenile part (i.e. with smaller whorl-width) the curved, prorsiradiate ribbing is quite distinct. There are two rows of tubercules on the wide and low ribs: one in the outer third of the flank and another at the ventrolateral edge. The

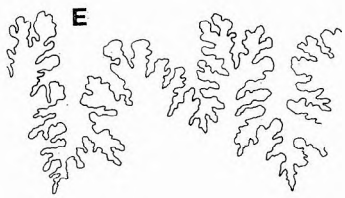
ribbing on the body-chamber fades away gradually, i.e. the ribs tend to be more wider and the tubercules diminish. The aperture (Pl. XXI, fig. 2) is oblique, with a strong constriction behind the peristome.

The suture-line (Text-fig. 78) of the larger figured specimen is irregular, with asymmetric external lobe.

Remarks: *S. baculatum* differs from the other congeneric forms by its entirely uncoiled habit, prorsiradiate, wide, low ribs and rounded lateral tubercules. In spite of the variability of ribbing, which clearly reflected as it is on the various illustrations in the literature, this is a species of limited morphology. A synonym of the species is the form described by BUCKMAN (1909—30) as *Rhabdodites rhabdodes* (cf. STURANI 1971, p. 170; PAVIA 1972, p. 125).



Text-fig. 77. Whorl-section of *Spiroceras baculatum* (J9392), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 78. Suture-line of *Spiroceras baculatum* (J9392), VI/16, Subfurcatum and Garantiana Z.

Distribution: This originally Swabian (SW Germany) species has been of common record in both the NW European and Mediterranean region. It is a characteristic form in the Subfurcatum Zone, indicating its middle subzone (WESTERMANN 1967; PAVIA and STURANI 1968; STURANI 1971; PAVIA 1972). At Gyenespuszta, the specimens have been yielded by Beds 17 and 16 of Profile VI, i.e. in the Subfurcatum and Garantiana Zones.

Spiroceras orbignyi (BAUGIER et SAUZÉ, 1843)

Pl. XXII, figs. 1—2, Text-figs. 79, 80

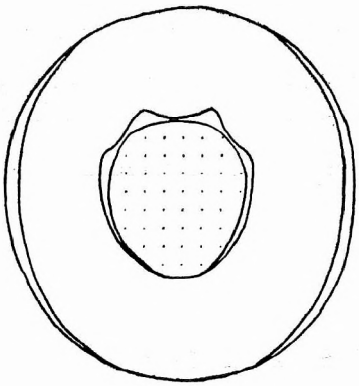
1843. *Toxoceras Orbignyi* — BAUGIER—SAUZÉ, p. 130, pl. I, figs. 1—4.
1843. *Toxoceras Orbignyi* — D'ORBIGNY (1842—51), p. 593, pl. 231, pl. 232, fig. 1—2.
1881. *Ancyloceras baculatum* QUENST. sp. — BÖCKH, p. 65, pl. III, fig. 2 (only).
1923. *Patoceras Orbigny* BAUG. et SAUZ. sp. — FALLOT—BLANCHET, p. 131, pl. III, figs. 8—9.
1923. *Toxoceras (Patoceras) Orbignyi* BAUGIER et SAUZÉ — LISSAJOUS, p. 52, pl. IV, fig. 3.
1927. *Spiroceras orbignyi* BAUGIER et SAUZÉ — ROMAN—PÉTOURAUD, p. 36, pl. IV, fig. 14.
1929. *Spiroceras orbignyi* BAUG. et SAUZ. — POTONIÉ, p. 247, pl. 18, figs. 29—32.
1963. *Spiroceras orbignyi* (BAUGIER et SAUZÉ) — NAGY, p. 198, pl. I, figs. 3—4.
1967. *Spiroceras* cf. *S. orbignyi* BAUGIER et SAUZÉ — IMLAY, p. 88, pl. 6, figs. 4—6, 9, 11.
1970. *Spiroceras orbigny* (BAUGIER et SAUZÉ) — GALÁCZ, p. 118.
1975. *Spiroceras orbignyi* (BAUGIER u. SAUZÉ) — DIETL, text-fig. 2, pl. 1, figs. 2—6.
1977. *Spiroceras orbignyi* (BAUG. et S.) — DIETL, p. 34, pl. 4, fig. 5.

Material: 21 fragmentary internal casts of different size.

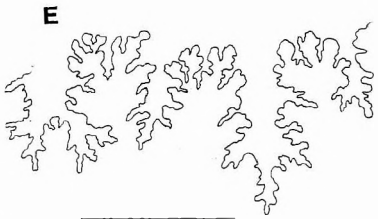
Description: The most entire specimen figured here on Pl. XXII, fig. 1 is a 20.5-cm-long, slightly curved fragment, of which a 7.5-cm-long part is phragmocone. The other specimens are also curved irregularly; the phragmocones are generally more arched, while the body-chambers are straight, with a curve again near the aperture (Pl. XXII, fig. 2a). The whorl-section (Text-fig. 79) is quadrate, with rounded edges. The ribbing is built-up of simple, prorsiradiate, low ribs emerging from the umbilical edge and arched backwards at the beginning. On the ribs there are two rows of tubercules: one on the ventrolateral margin and another on the venter. Here the ribs fade away, forming a smooth ventral band. The ribs tend to decline near the aperture. Specimens with entirely preserved peristome are unknown in the material.

The suture-line (Text-fig. 80) is relatively simple, with a wide, moderately deep E and a short and oblique L. The three-pronged U_2 is well-divided, deeper than E. The saddles are also well-divided.

Remarks: The species *S. orbignyi* differs from the other congeneric forms by its angular whorl-section, the two equally strong and acute tubercules on each ribs and the smooth dorsal side.



Text-fig. 79. Whorl-section of *Spiroceras orbignyi* (J9395), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 80. Suture-line of *Spiroceras orbignyi* (J9394), VI/16, Subfurcatum and Garantiana Z.

Distribution: This species was recorded from both the NW European and Mediterranean region, from the Upper Bajocian Garantiana Zone. The Gyenespuszta specimens have come from Bed 16, i.e. from the Subfurcatum and Garantiana Zones of Profile VI.

Genus PARAPATOCERAS Spath, 1924

Type species, by original designation (Spath 1924, p. 12), *Ancyloceras calloviensis* Morris 1845, which is a synonym (see Potonié 1929, p. 249) of *Ancyloceras distans* (Baugier et Sauzé 1843, p. 13, pl. 3, fig. 8).

General remarks: Spath (loc. cit.), the founder of the genus, gave no morphological diagnosis of the *Parapatoceras*. On the basis of the works of subsequent authors, *Parapatoceras* is characterized by closely coiled early whorls, widely-spaced ribs, which are straight and continuous on the dorsal side.

According to Spath (1924), *Parapatoceras* is an independent heteromorph, which is rather related to *Reineckeia*, and has no connection with the *Spiroceras*. On the other hand, the Bathonian appearance of the genus makes this origination unprobable. Wiedmann (1969) suggested *Parapatoceras* to be a descendant of *Spiroceras* and a basic stock for other heteromorphous genera in the Callovian.

Distribution: Data on Bathonian heteromorphous ammonites are scarce. According to Wiedmann (1969, text-fig. 2), the genus *Spiroceras* endures up to the Upper Bathonian, but the figured "Bathonian" *Spiroceras* can be rather regarded as Bajocian elements, which had been erroneously admixed to Bathonian materials (see above, p. 96). On the other hand, the representatives of *Parapatoceras* are repeatedly recorded from the Upper Bathonian. *P. distans benzi* was mentioned by numerous authors in NW Germany (for a review see Westermann 1958, p. 73), and *Parapatoceras* species are characteristic in France from the Upper Bathonian Retrocostatum Zone onwards (Elmi 1962, p. 537; Elmi 1967, p. 454, text-fig. 85; Mangold et al. 1967, p. 125; Mouterde et al. 1971, p. 15). On the basis of a new Gyenespuszta find, the appearance of the genus *Parapatoceras* should be placed into the Early Bathonian (Galácz 1970, p. 120). In this way, despite the preclusion of the possibility of Bathonian *Spiroceras* occurrences, the gap between these two genera remains narrow.

Dimorphism: No possible dimorphic pair among the *Parapatoceras* is known.

Parapatoceras sp.

Pl. XXII, fig. 4

1970. *Parapatoceras* sp. — Galácz, p. 120.

Material: A single body-chamber fragment.

Description: The specimen is fragment of a slightly curved, non-septate, 6-cm-long, internal cast. The whorl-section is subcircular, somewhat compressed laterally. The ribbing is moderately dense, the ribs are blunt, straight, proverse, ending in weak tubercules at the sides of the

smooth ventral band. On the internal mould a longitudinal furrow indicates the position of the siphon. The apertural part is broken.

Remarks: On the basis of the straight ribs, which are uncurved on the dorsal side, the Gyenespuszta specimen seems to belong to this genus. Specific determination—for lack of the more closely coiled whorls—is impossible.

Distribution: This single specimen has come from Bed 10, i.e. from the Lower Bathonian (Zigzag Zone) of Profile VI.

Familia **Morphoceratidae** HYATT, 1900

Genus DIMORPHINITES BUCKMAN, 1923

Type species, by original designation (BUCKMAN 1923, in 1909—30, pl. 377), *Am. dimorphus* D'ORBIGNY (1842—51, p. 410, pl. 141, figs. 1—8).

General remarks: The genus was designated by BUCKMAN (loc. cit.) for Upper Bajocian forms previously assigned to the genus *Morphoceras*. He placed (1924 in 1909—30, pl. 510) into the same genus *Am. defrancii* D'ORBIGNY (1842—51, p. 389, pl. 129, figs. 7—8) which had been considered a member of the Morphoceratidae by DE GROSSOUVRE (1919, p. 389).

This genus occupies an important position within the Middle Jurassic lineages of the Perisphinctidae, by evidencing that the family Morphoceratidae has close connections with the Upper Bajocian genera (e.g. *Leptosphinctes*, *Prorsisphinctes*) of the Perisphinctidae family (see STURANI 1964b, p. 28; MANGOLD 1970a, p. 53).

Distribution: *D. dimorphus*, the most common species of this genus occurs both in NW European and Mediterranean areas. Other species are rare, and even the records of *D. defrancii* are rather doubtful, as earlier authors included in this species a series of different Upper Bajocian and Bathonian microconchiate perisphinctids. All the confirmed *Dimorphinites* records refer to the Upper Bajocian Parkinsoni Zone. STURANI (1971, p. 175) mentioned, that the Subfurcatum Zone date of *D. dimorphoides* (PARONA) was uncertain. Similarly uncertain are the *Dimorphinites* from the Lower Bathonian of Sicily (WENDT 1964, pp. 133—135). On the basis of their ribbing, these three specimens can be assigned to *Ebrayiceras*, as well as *Morphoceras* s.s., since ARKELL (1951—59, p. 142) mentioned forms without ventral furrow from both genera. However, the coiling and the whorl-section of these Sicilian forms show closer resemblance to the genus *Dimorphinites*, therefore the possibility of local Lower Bathonian survival of this genus cannot be precluded.

Dimorphism: Within the genus *Dimorphinites* the group of *D. dimorphus* (incl. *D. compressus* n. sp. see in this work below) can be regarded as macroconchiate forms of comparatively larger size and with simple peristome. On the other hand, the group of *D. defrancii* (incl. *D. dimorphoides*) comprises smaller, lappetted forms. The species *D. defrancii* has long since been regarded as a microconch (see DOUVILLÉ 1880, p. 212; GLANGEAUD 1897, p. 100; MANGOLD 1970a, pp. 114, 116; STURANI 1971, p. 176), and by virtue of the subgeneric dimorph-distinction adopted in this work, it should be assigned to a distinct subgenus. The material at my disposal (a single specimen!) does not enable me to designate a new subgenus, with proper morphological and stratigraphical diagnoses. Therefore I refer to this group as an "unnamed subgenus". STURANI (1971, p. 176) indicated too—in connection with *D. defrancii*—the need for separating these species.

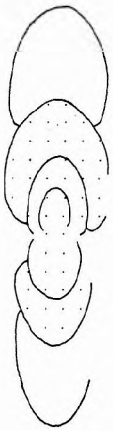
Dimorphinites (Dimorphinites) dimorphus (D'ORBIGNY, 1846)

Pl. XXIII, figs. 1—3, 5, Text-figs. 81, 82, 83

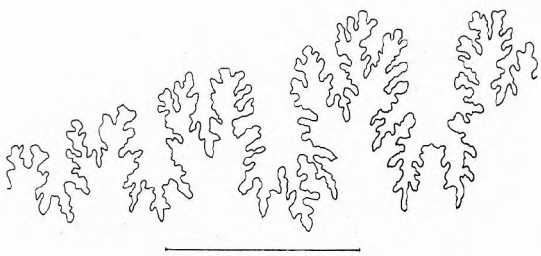
1846. *Ammonites dimorphus* — D'ORBIGNY (1842—51), p. 410, pl. 141, figs. 1—8.
1923. *Dimorphinites dimorphus* D'ORBIGNY sp. — BUCKMAN (1909—30), pl. 377, figs. 1—3.
1930. *Morphoceras dimorphum* D'ORBIGNY — ROMAN, p. 17, pl. VII, figs. 1—2.
1964. *Dimorphinites dimorphus* (ORBIGNY) — WENDT, p. 133, pl. 21, fig. 3 (only).
1964a. *Dimorphinites dimorphus* (D'ORBIGNY) — STURANI, p. 37, pl. 6, fig. 4.
1964b. *Dimorphinites dimorphus* (D'ORBIGNY) — STURANI, p. 26, pl. 3, figs. 3—4, text-fig. 22.
1970. *Dimorphinites dimorphus* (D'ORB.) — GALÁCZ, p. 119.
1972. *Dimorphinites dimorphus* (D'ORBIGNY) — KRYSTYN, p. 262, pl. 8, fig. 4.

Material: 71 relatively well-preserved and 24 fragmentary, incomplete specimens.

Dimensions:				
J9363:	77;	21 (27);	14 (18);	40 (51)
J9361:	53;	16 (30);	15 (28);	25.5 (48)
J9360:	51;	20 (39);	22 (43);	12.5 (24.5)
J9362:	40;	22 (55);	20.5 (51);	4 (10)

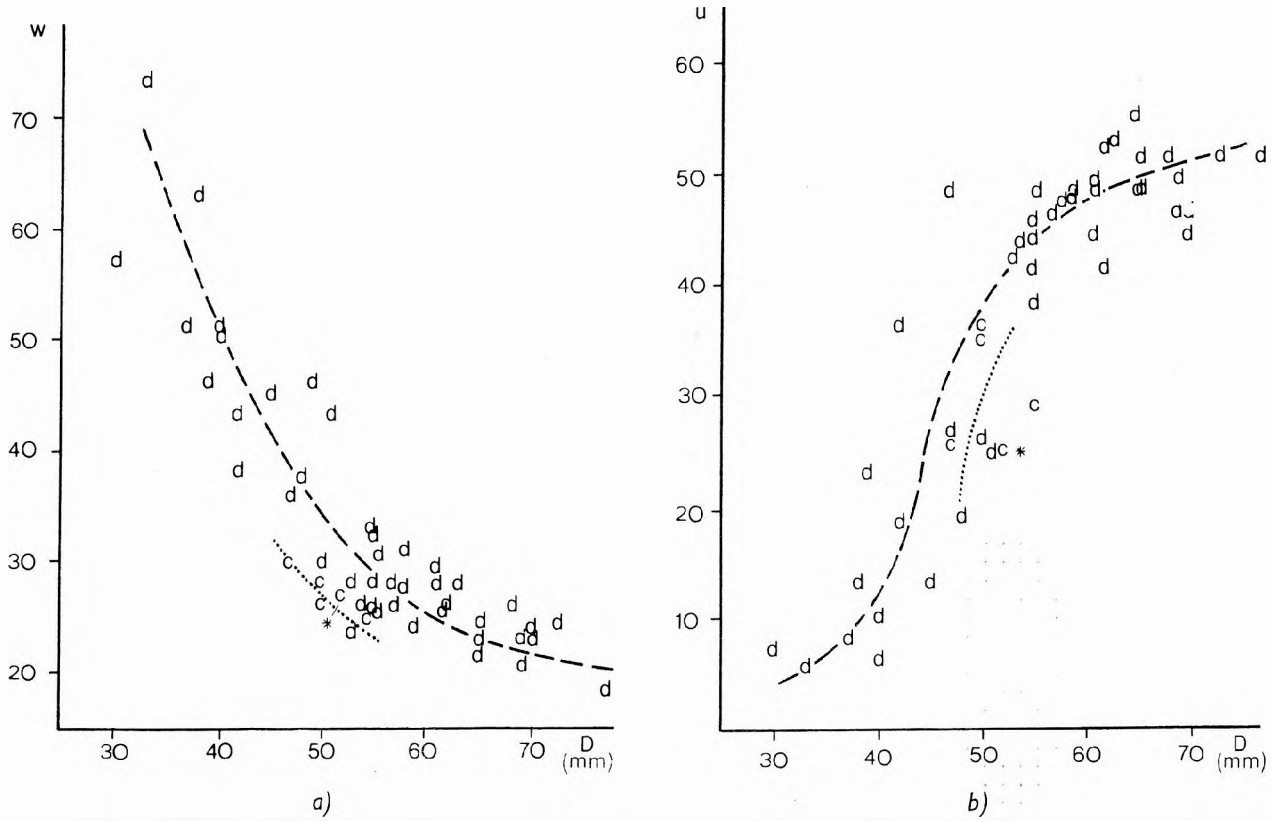


Text-fig. 81. Whorl-section of *Dimorphinites (D.) dimorphus* (J9364), VI/13, Parkinsoni Z.



Text-fig. 82. Suture-line of *Dimorphinites (D.) dimorphus* (J9362), VI/13, Parkinsoni Z.

D e s c r i p t i o n : The figured specimens roughly represent the ontogenic stages of this species, encountered in great number at Gyenespuszta. The inner whorls are involute, sphaeroconic, with a nearly occluded umbilicus, convex whorl-sides and a highly-arched venter. From the end of the phragmocone the umbilicus widens abruptly, and the coiling becomes evolute, with a contracted body-chamber and flattened whorl-sides. The whorl-section (Text-fig. 81) is semicircular in the inner whorls and high-oval in the body-chamber. The place of the maximal whorl-thickness sinks from the middle of the flanks on the inner whorls to near the umbilical margin on the body-chamber. All the available specimens are internal casts, thus the ornamentation is weaker. The ribbing is irregular. The low, blunt, rectiradiate primary ribs emerge from the umbilical edge, and bi- or trifurcate at variable height close to the middle of the flanks. The secondary and intercalatory ribs are somewhat thinner and cross the venter without interruption. The ribbing shows some change during the ontogeny: the inner whorls bear stronger and denser ribs, while on the body-chamber the ribs, which



Text-fig. 83. Whorl-width (a) and umbilicus (b) against diameter of *Dimorphinites (D.) dimorphus* (d) and *Dimorphinites (D.) compressus* (c) from Gyenespuszta. * = measurements of the holotype of *D. (D.) compressus* n. sp.

persist up to the aperture, are weaker. Besides the ribbing, the strong constrictions are very characteristic. These cross the ribbing, their posterior margins are slightly swollen. The direction of the constrictions is radial on the inner and proverse on the outer whorls. The number of the constrictions is 3 to 4 on the inner whorls and 2 to 3 on the body-chamber. The length of the heavily contracted body-chamber is about one whorl. The aperture is constricted, with a simple peristome.

The suture-line (Text-fig. 82) is relatively well-divided. E is wide, with small accessories. L is three-pronged, somewhat deeper than E. The auxiliaries are also three-pronged and wide, and slightly retracted. The saddles are asymmetric, with more divdied outer elements.

Remarks: The species *D. dimorphus* is a markedly variable form. On the basis of the rich material of Gyenespuszta, it is clear, that the main variations appear in the size of the adult specimens and the whorl-section. The species is commonly recorded, but rarely illustrated in the literature. Good specimens were figured by BUCKMAN (1909—30, pl. 377) and ROMAN (1930, pl. VII, figs. 1—2). The ventral furrow on the specimen figured by STURANI (1964b, pl. III, fig. 3) is undoubtedly an individual aberration. The specimen figured by WENDT (1964) in his pl. 21, fig. 4 is an entirely different form (see STURANI 1964b, p. 26), and with its wider umbilicus and dense, sharp ribbing, it differs from all the known species of the genus.

Distribution: *D. dimorphus* is a species occurring at both NW European and Mediterranean localities. It is a Parkinsoni Zone form, the single Bathonian occurrence of this species has so far been recorded only from a condensed fauna from Sicily (WENDT 1964). At Gyenespuszta it appears in the Parkinsoni Zone (Beds 15 to 13 of Profile VI), being characteristic of its upper part.

Dimorphinites (Dimorphinites) compressus n. sp.

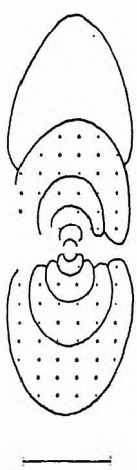
Pl. XXIII, figs. 4, 6, Text-figs. 84, 85

1970. *Dimorphinites* n. sp. — GALÁCZ, p. 119.

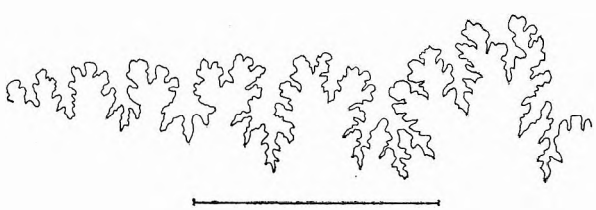
Holotype: Pl. XXIII, fig. 4; J9366.
Locus typicus: Gyenespuszta, Northern Bakony, Transdanubian Central Mountains, Profile VI.
Stratum typicum: Bed 13 = Upper Bajocian, upper part of the Parkinsonia parkinsoni Zone; ammonitico rosso limestone.
Derivatio nominis: *compressus* (Lat.) = flattened laterally; after the laterally compressed whorl-section of the species.
Diagnosis: Compressed, weakly-ribbed form with few constrictions and non-retracted auxiliary elements in the suture-line.
Material: Beside the holotype, 4 relatively well-preserved and 6 incomplete, fragmentary specimens.

Dimensions:				
J9367:	55;	21.5 (39);	14 (25.5);	15.5 (28)
Holotype, J9366:	52;	19.5 (37.5);	14 (27);	13 (25)
J9365:	50;	17 (34);	14 (28);	17.5 (35)
J9369:	50;	17 (34);	13 (26);	18 (36)
J9368:	47;	19 (40.5);	14 (30);	12 (25.5)

Description: The holotype is a small, well-preserved, but partly broken internal mould. The coiling is excentric: the umbilicus of the inner whorls is narrow, nearly occluded, but at the beginning of the body-chamber it widens rapidly. The whorl-sides are slightly convex on the inner whorls and flattened, convergent on the body-chamber. Accordingly, the whorl-section is initially high-oval, then triangular, with its maximal width first at the middle of the flanks and then at the



Text-fig. 84. Whorl-section of *Dimorphinites (D.) compressus* n. sp. (J9368), VI/13, Parkinsoni Z.



Text-fig. 85. Suture-line of *Dimorphinites (D.) compressus* n. sp. (J9365), VI/13, Parkinsoni Z.

umbilical edge. The ornamentation—in particular on the internal mould—is rather weak. The septate whorls bear low, curved, prorsiradiate ribs of irregular strength, which bi- or trifurcate near the upper third of the flanks. The secondary ribs cross the venter without interruption. The heavily contracted body-chamber begins at about 31 mm diameter and shows a very reduced ribbing. There are extremely slight, forward-arched constrictions on the whorls. The length of the body-chamber is unknown, because entire specimens, with preserved aperture, are missing in the material available.

The suture-line is well-divided. As compared to that of *D. dimorphus*, this new species has lower saddles, wider ES and straight-axed auxiliary lobes.

Remarks: On the basis of features mentioned in the diagnosis, *D. compressus* can be easily distinguished from the congeneric forms. The most closely allied form is *D. dimorphus*, but this latter species—despite of its wide variability—is a more inflated, coarsely ribbed form. The differences of the suture-lines are of particular importance, for STURANI (1964b, p. 28) set forth some phylogenetic considerations based on the retracted auxiliaries of *D. dimorphus*.

Distribution: The specimens of this new species have come from the upper part of the Parkinsoni Zone, i.e. Bed 13 of Profile VI.

Dimorphinites (unnamed subg.) **defrancii** (D'ORBIGNY, 1846)

Pl. XXII, fig. 3

1846. *Ammonites Defrancii* D'ORB. — D'ORBIGNY (1842—51), p. 239, pl. 129, figs. 7—8.
non 1887. *Ammonites Defrancii* D'ORB. — QUENSTEDT (1886—87), p. 677, pl. 79, fig. 27.
1897. *Ammonites Defrancei* D'ORB. — GLANGEAUD, p. 100, pl. III, figs. 1—3.
?1924. *Dimorphinites defrancii* D'ORBIGNY sp. — BUCKMAN (1909—30), pl. 510.
non 1961. *Grossouvria defrancei* ORBIGNY — KRYMHOLZ, p. 129, pl. VII, fig. 4.
non 1963. *Perisphinctes defrancei* (ORBIGNY) — AZARIAN, p. 211, pl. VII, fig. 6.

Material: A single, relatively well-preserved specimen.
Dimensions: J9370: 35; 11 (31.5); ? (?); 15 (43)

Description: Small-sized, evolute, auriculate ammonite. The umbilicus is wide and shallow, the whorl-section is ovally-shaped, with a low umbilical wall, a rounded umbilical edge, convex whorl-sides and an arched venter. The ribbing is rather dense. The straight, slightly prorsiradiate primary ribs arise from the umbilical seam, and branch somewhat irregularly near the outer third of the flanks. Because of the state of preservation of the last whorl, the features of the secondary ribs and the venter cannot be studied. The primary ribs of the last whorl are 51 in number. There are four narrow and deep constrictions per whorl. The body-chamber begins at about 20 mm diameter, and occupies three-fourth of the last whorl. Just before the aperture there are some coarse simple ribs, the peristome bears short lappets. Sutures not decipherable.

Remarks: On the basis of its coiling, ribbing and the presence of the lappets, *D. defrancii* is an easily distinguished form. Having a denser ribbing the Gyenespuszta specimen differs from the type. The specimen figured by BUCKMAN (1909—30, pl. 510) is also different, because it shows a narrower umbilicus and more inflated whorls. Beside the holotype and this latter specimen from Dorset, other figured forms are rare in the literature, but records are common. From these that by ANDELKOVIČ and JAVIDPOUR (1966, p. 5) from the Middle Bathonian is certainly a misinterpretation, and probably refers to a small-sized *Siemiradzkia*. Similarly, a Bathonian perisphinctid was figured under this name from the Caucasus by KRYMHOLZ (1961). The specimen on the figure of AZARIAN (1963, pl. VII, fig. 6) from the Upper Bajocian of Armenia is close to the species *Vermisphinctes (Prorsisphinctes) venetus* STURANI (see below, p. 111).

Distribution: *D. defrancii* has been previously recorded from Normandy (type locality; see D'ORBIGNY 1842—51; SIEMIRADZKI 1899, p. 80; DE GROSSOUVRE 1919, p. 384) and Southern England (OPPEL 1856—58, p. 598; BUCKMAN 1909—30). Here the stratigraphic range of this species is restricted to the lower part of the Parkinsoni Zone (see ARKELL 1956, p. 50). The Gyenespuszta specimen is the first figured find from the Mediterranean region, from stratigraphically corresponding horizon: the lower Parkinsoni Zone (Bed 15, Profile VI).

Familia **Perisphinctidae** STEINMANN, 1890
Subfamilia *Leptosphinctinae* ARKELL, 1950

General remarks: Beside parkinsoniids and morphoceratids, this subfamily comprises the Upper Bajocian perisphinctids. The first representatives of this highly diverse group arise in the Sauzei Zone of Alaska (IMLAY 1961; 1964) and Argentine (JAWORSKI 1926). The Alaskan *Parabigotites*

crassicostatus IMLAY (1961, p. 472, pl. 64, figs. 4—10; 1964, p. B54, pl. 29, figs. 1—16) very closely resembles certain *Normannites* s.l., thus the origination of perisphinctids from the Stephanoceratidae seems to be very likely. The Argentine form (JAWORSKI 1926, p. 262, pl. II, fig. 4) which was named *Praeleptosphinctes jaworskii* by WESTERMANN (1956a, p. 268), occurs also in the Sauzei Zone. However, it shows no similarity to the *Parabigotites*, being rather similar to *Leptosphinctes* s.s.

Leptosphinctinae get enriched abruptly at the base of the Subfurcatum Zone, and later give way to several important Middle Jurassic perisphinctid lineages.

Straight from their appearance, the members of the Leptosphinctinae subfamily show definite dimorphism. The character of this dimorphism agrees with that in the Bajocian stephanoceratids, i.e. parallel lines of large forms with entire and small forms with lappetted peristome appear. It was STURANI (1971, p. 129) who called attention to the microconch pair (*"Normannites" kialagvikensis* IMLAY 1964, p. B43, pl. 13, figs. 1—8, 10—11, 17) of the *Parabigotites*, and it was he who suggested at the same time that introduction of a new subgeneric name for this microconch was needed.

Within this subfamily the macroconch-microconch pairing can be carried out, thus the rearrangement and the clearing up of the generic-subgeneric ranks of the existing names should be attempted. The following review is a tentative summary of a taxonomy in accordance with dimorphism.

Parabigotites IMLAY, 1961 (p. 472), type species, by original designation, *P. crassicostatus* IMLAY, Kialagvik Formation, upper part (Sauzei Zone), of W Alaska. Very evolutely coiled form with depressed whorl-section, biplicate, strongly projected ribs, which endure on the body-chamber without fading, and are continuous on the venter. The inner whorls are non-tuberculate. Weak constrictions are present, the aperture is simple. It is known only from Alaska.

Parabigotites (unnamed subgenus). The single known representative of this group is the *"Normannites" kialagvikensis* IMLAY (see in STURANI 1971, p. 129). Small-sized, evolute ammonite, with depressed whorl-section, biplicate, coarse, prorsiradiate ribs without interruptions on the venter. On the inner whorls the furcation points show tubercules. Weak constrictions are visible. The peristome bears lateral lappets. It is the microconch subgenus of *Parabigotites*. Outside the Alaskan type locality, it is recorded recently, with a question mark, from Southern England (PARSONS 1974, p. 166).

Leptosphinctes BUCKMAN, 1920 (in 1909—30, pl. 160). Type species, by original designation, *L. leptus* BUCKMAN, from the basal upper Inferior Oolite (upper part of the Subfurcatum Zone) from Dorset, England. Medium- to large-sized, evolute forms with compressed whorls and fine ribbing, which fades away in the outer part of the body-chamber. The nucleus is tuberculated. Constrictions appear throughout the whorls, the aperture is simple. Earliest forms occur in the Sauzei Zone of Argentine and Alaska, and the greatest profusion of the subgenus occurs in the Subfurcatum Zone, with a wide geographic distribution over Mediterranean, NW European and Pacific regions (for the latter, see IMLAY 1964; WESTERMANN and RICCARDI 1972).
Synonyms: *Praeleptosphinctes* WESTERMANN, 1956a (p. 268). Type species, by original designation, *P. jaworskii* WESTERMANN, from the Argentine Sauzei Zone. As was emphasized by ARKELL (1951—59, p. 167), this genus should be assigned to *Leptosphinctes* s.s.
ARKELL (loc. cit., p. 167) regarded *Praebigotites* WETZEL (1936, p. 533, type species, by original designation, *P. westfalicus* WETZEL 1936, pl. XXI, figs. 1—4, text-figs. 5—8) as a synonym of *Leptosphinctes*. However, this small perisphinctid from the lowermost part of the Subfurcatum Zone shows, with its ribbing and suture-line, closer similarity to the genus *Caumontisphinctes*.

Leptosphinctes (Cleistosphinctes) ARKELL, 1953 (in ARKELL and LUCAS 1953). Type species, by original designation, *Leptosphinctes cleistus* BUCKMAN, S. S., 1920 (in 1909—30, pl. 561) from the Inferior Oolite (Subfurcatum Zone) of Dorset, Southern England. Small, moderately evolute, compressed forms, with fine bi- or triplicate ribbing, and with tubercules on the inner whorls of some species. No constrictions. The peristome bears large, spatulate lappets. It is the microconch subgenus of *Leptosphinctes*, with numerous species known so far exclusively from the Subfurcatum Zone of several Mediterranean and NW European localities.
Synonym: *Kubanoceras* KAKHADZE et ZESASHVILI, 1955 (p. 707). Type-species, by original designation, *"Perisphinctes (Grossouvria) asinus"* ZATWORNITZKY, 1914 (p. 553, pl. VIII, figs. 20—22) from the Subfurcatum Zone of the Kuban Valley, USSR. ARKELL (1951—59, p. 169; 1956, p. 363) showed that this form was a typical *Cleistosphinctes*. Subsequently KAKHADZE and ZESASHVILI (1956, pp. 31—40) placed several Upper Bajocian Leptosphinctinae into *Kubanoceras*, which are, in fact, different forms of *Prorsisphinctes*, *Vermisphinctes*, *Leptosphinctes* and *Cleistosphinctes*.

Vermisphinctes BUCKMAN, S. S., 1920 (in 1909—30, pl. 162). Type species, by original designation, *V. vermiformis* BUCKMAN, from the Parkinsoni Zone of Dorset, Southern England. This subgenus

comprises medium-sized, compressed, sharp-ribbed, constricted forms. According to ARKELL's convincing arguments (1951—59, p. 168), the aperture bears lateral lappets, however, no lappetted forms have been figured in the literature so far. ARKELL (loc. cit.) assigned to *Vermisphinctes* the "*Bigotites*" *althoffi* WETZEL, 1937 (p. 99, pl. X, fig. 10, pl. XI, figs. 1a-b), which is placed by PAVIA (1972, p. 138) into the microconch subgenus of *Bigotites*. This latter procedure is supported by the fact, that WETZEL (loc. cit. p. 100) mentioned in his description the presence of a ventral furrow in his specimen. On the other hand, the features of the ribbing show closer similarity to *Vermisphinctes*, thus until detailed studies of additional material are carried out, *Vermisphinctes* could be regarded as a microconch subgenus, which stratigraphically corresponds best to macroconchiate *Prorsisphinctes*. According to the rules of nomenclature, the generic name *Vermisphinctes* should be maintained, with a subgeneric rank for the *Prorsisphinctes*. The species of the subgenus *Vermisphinctes* are known from both Mediterranean and NW European localities.
S y n o n y m : *Spathia* SCHINDEWOLF, 1925 (p. 319), for discussion, see ARKELL 1951—59, p. 168.

Vermisphinctes (Prorsisphinctes) BUCKMAN, 1920 (in 1909—30, pl. 162). Type species, by original designation, *Perisphinctes pseudomartinsi* SIEMIRADZKI, 1899 (p. 328, pl. XXII, fig. 27) from the Garantiana Zone of Bayeux, Normandy, France. Large, evolute perisphinctids of rounded whorl-section, regular, prorsiradiate ribbing, which cross the venter without interruption and fade out on the body-chamber. The inner whorls are non-tuberculate. The constrictions are strong, deep. The aperture is slightly expanded, with entire peristome. It is the macroconch subgenus of *Vermisphinctes*. Its numerous species occur in relatively wide distribution, with localities from both the Mediterranean and NW European regions, in the Garantiana and Parkinsoni Zones of the Upper Bajocian.
The synonyms were discussed by ARKELL (1951—59, p. 168) in detail.

Bigotites NICOLESCO, 1918 (p. 36). Lectotype species *Bigotella petri* NICOLESCO, 1917 (p. 167, pl. IV, figs. 4—5), from the Garantiana Zone of Bayeux, Normandy (France), designated by NICOLESCO (1931, p. 23). This genus unites medium-sized, moderately evolute forms of rounded cross-section. The ribbing consists of strong, blunt, radial primaries and prorsiradiate secondaries, which get interrupted along a ventral smooth band or furrow. The constrictions are very strong, with abrupt enlargements of the whorls after these constrictions.
The species of the genus *Bigotites* appear in extended diversity in the Garantiana Zone, and endure well into the Lower Bathonian. The genus itself can be unequivocally originated from the *Leptosphinctes* of the Subfurcatum Zone. And of particular interest in this respect is *L.? (L.?) subcoronatus* of PAVIA (1972, p. 130), which shows *Bigotites* features (cf. PAVIA, loc. cit. p. 131), especially on the inner and middle whorls. The Lower Bathonian occurrence of *Bigotites (B. diniensis)* was quoted from SE France by STURANI (1966, p. 40), who demonstrated, that the important Bathonian *Zigzagiceras* and *Procerites* lineages could be derived from this genus (STURANI, loc. cit., p. 18). Accordingly, the genus *Bigotites* would be important link between the Middle and Upper Bajocian Leptosphinctinae and the Bathonian Zigzagiceratinae. *Bigotites* species appear in abundance in the Mediterranean and NW European regions, mainly in the Garantiana and Parkinsoni Zones.
The synonyms were discussed by ARKELL (1951—59, p. 167).

Bigotites (unnamed subgenus). The microconch subgenus of *Bigotites* is represented with some forms in the earlier literature, but the designation of a new subgenus would be faced with difficulties. First to recognize microconch forms within *Bigotites* was PAVIA (1972, p. 138), and it was also he who suggested a subgeneric separation for this group. On the other hand, the single form he included here was *Bigotites althoffi* WETZEL, which may perhaps be assigned to another genus (see above). However, the specimen presented by PAVIA as *B.* (subg.) *althoffi*, differs from WETZEL's holotype by its size, coiling and ribbing, and is undoubtedly a microconchiate *Bigotites*. Therefore the specific revision of PAVIA's specimen is needed, and after this procedure this (new) species might be the type of the microconch subgenus of *Bigotites*.
PAVIA (loc. cit.) figured two microconchiate *Bigotites* in his monograph. The above discussed "*B.* (subg.) *althoffi*" seems to be the counterpart of the more common, evolute, strongly ribbed *Bigotites* species, while his *Bigotites?* (subg.?) n. sp. is apparently a proper match to the *Bigotites* group of compressed whorl-section and curved ribbing (i.e. *Bajocisphinctes* auctt.).
Bigotites microconches have been recorded rarely, with Mediterranean and NW European occurrences (e.g. BENTZ 1924, pl. 9, figs. 3—4; WETZEL 1937, pl. 10, fig. 15).

The above summary of the Leptosphinctinae subfamily can hardly be supplemented with arguments derived from the studied Gyenespuszta material. This fact is due to the poor, fragmentary

preservation of the majority of the specimens, as the apertural part is usually broken off. Most common are the species of *Vermisphinctes (Prorsisphintes)* and *Leptosphinctes* s.s., and some specimens of *Bigotites* and *Cleistosphinctes* have also been collected. Additionally, the stratigraphic evaluation and the comparison of the dimorphic pairs have been hampered by the condensed nature of the sequence, and the inseparability of the Subfurcatum and Garantiana Zones.

Leptosphinctes (Leptosphinctes) davidsoni (Buckman, 1881)

Pl. XXIV, figs. 1–2, Text-fig. 86

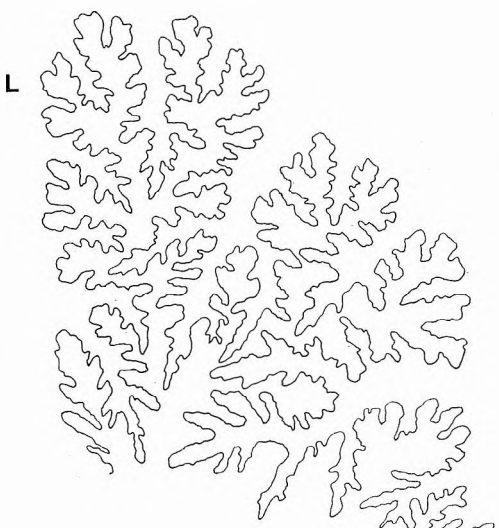
1881. *Perisphinctes Davidsoni* S. S. Buckman sp. — Buckman, p. 602.
1883. *Perisphinctes Davidsoni* S. S. Buck. — Buckman, p. 144, pl. IV, fig. 1 (only).
1899. *Perisphinctes Davidsoni* Buckman — Siemiradzki, p. 337, pl. XXIII, fig. 31.
1921. *Leptosphinctes davidsoni* S. Buckman sp. — Buckman (1909–30), pl. 201, figs. 1–3.
1970. *Leptosphinctes davidsoni* Buckman — Galácz, p. 118.
1975. *Leptosphinctes (Leptosphinctes)* aff. *davidsoni* (S. Buckman) — Parsons, p. 200, pl. 36, fig. 4, text-fig. 6.

Material: Two poorly preserved fragments of inner whorls and one well-preserved, entire specimen.

Dimensions:

J9398:	200;	50 (25);	?48 (?24);	104 (52)
	165;	51 (31);	42 (25.5);	78 (46)
J9399:	78;	23 (29.5);	18 (23);	37 (47.5)

Description: The figured specimen is an internal mould of a large, slightly ellipticone ammonite. The umbilical wall is high, convex, the umbilical margin is rounded. The flanks are slightly convex, and meet the narrow, highly arched venter in a rounded ventrolateral edge. The whorl-section is high-oval, with its maximal thickness at the lower third of the whorl-height. The ribbing is strong on the inner whorls (Pl. XXIV, fig. 2b), and fades out gradually on the outer whorls. The dense, curved, prorsiradiate primary ribs emerge from the umbilical wall and branch into secondaries at the upper third of the flanks. The furcation points lie above the umbilical seam, thus the secondaries of the earlier whorls cannot be seen on the larger, entire specimen. The fragmentary inner whorls of the material show a ribbing similar to that on the specimens figured by Siemiradzki (1899, pl. XXIII, fig. 31) and Parsons (1975, pl. 36, fig. 4). Beside the ribbing, moderately deep, prorsiradiate constrictions occur at every 3/4 whorl. The contracted body-chamber begins at 165 mm diameter, its length is 4/5 of a whorl. The ribs endure up to the aperture, but only weak, wide primary ribs are visible on the inner half of the whorl-side. The aperture is projected, with a prominent, but simple peristome, which is bordered by a wide and deep constriction.



Text-fig. 86. Suture-line of *Leptosphinctes (L.) davidsoni* (J9398), VI/16, Subfurcatum and Garantiana Z.

Sutures not seen clearly, but parts of wide, high saddles and strongly retracted auxiliaries can be traced.

Remarks: On the basis of its coiling, dimensions and constrictions the Gyenespuszta specimen agrees well with the holotype. There are some differences in the ribbing, i.e. the type shows more widely spaced ribs. On the other hand, characteristic features of the species *L. (L.) davidsoni* are rather the ellipticone coiling, the curved, prorsiradiate primaries and the high, non-tuberculate furcation point. With these characters this species differs clearly from *L. (L.) coronarius* Buckman, a form with short primaries and a distinct row of tubercules on its inner and middle whorls. *L. (L.) leptus* Buckman differs with its sharp, straight and radial primary ribs.

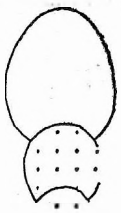
Distribution: The type came from the Banksi Subzone of the Subfurcatum Zone of Sherborne, Dorset (see Arkell 1951–59, p. 167 and Parsons 1975, p. 202). The specimen figured by Siemiradzki (1899) seems to have been collected from the same locality. The specimens mentioned or figured by Parsons (1975) are also from the lower part of the Subfurcatum Zone. The Gyenespuszta specimens have been collected from Bed 16 of Profile VI (Subfurcatum and Garantiana Zones).

Leptosphinctes (Cleistosphinctes) cleistus Buckman, 1920

Pl. XXIII, figs. 7–8, Text-fig. 87

1920. *Leptosphinctes cleistus* nov. — Buckman (1909–30), pl. 161, figs. 1–3.
1927. *Perisphinctes Martiusi* d'Orbigny — Roman–Pétouraud, p. 42, pl. V, fig. 2 (only).
?1943. *Leptosphinctes cleistus* Buckman — Roché, p. 22, pl. I, fig. 3.
1971. *Leptosphinctes (Cleistosphinctes) cleistus* Buckman — Sturani, p. 173, pl. 15, figs. 1–2.
1972. *Leptosphinctes (Cleistosphinctes) cleistus* S. Buckman — Pavia, p. 133, pl. 28, figs. 3, 5.

Material: Three, relatively well-preserved internal moulds.
Dimensions: J9402: 56; 17.5 (31); 13 (23); 25.5 (45.5)
J9401: 54; 16 (29.5); 12 (22.5); 26 (48)
J9403: 54; 16 (29.5); 12 (22.5); 26.5 (47)



Text-fig. 87. Whorl-section of *Leptosphinctes (Cleistosphinctes) cleistus* (J9403), VI/16, Subfurcatum and Garantiana Z.

Description: Small-sized form with an excentrically coiled body-chamber. The umbilicus is wide, the umbilical slope is low, the umbilical edge is rounded. The whorl-sides are convex on the inner whorls and flattened-convergent on the outer ones. The venter is narrow and highly arched. The whorl-section (Text-fig. 87) is subcoronate on the innermost and high-oval on the middle and the outer whorls. The place of maximal width gradually sinks from the middle of the whorl-sides to well below the middle. The strong, prorsiradiate primary ribs arise at the umbilical edge and branch into 2 or 3 secondary ribs. The secondaries tend to fade gradually on the body-chamber, but they strengthen again near the aperture. There are 39 primary ribs on the last whorl. The body-chamber begins at 36 mm, and occupies about 5/8 of a whorl. From 3 specimens of Gyenespuszta there are two adults with base and outlines of the large apertural lappets. Sutures not decipherable.

Remarks: *L. (C.) cleistus* is distinguished from the other *Cleistosphinctes* by its high-oval whorl-section and relatively wide umbilicus. There is some variability in rib-density. Beside the recent descriptions of this species given by Sturani (1971) and Pavia (1972), a conspecific form was figured by Roman (in Roman and Pétouraud 1927, pl. V, fig. 2). This form was previously assigned to *Cleistosphinctes* by Arkell (1956, p. 77). The figure shows close agreement with the type of Buckman, but its body-chamber is smooth. However, this seems to be due to the state of preservation, or to the acidic method of preparation (see pp. 8–9 in Roman and Pétouraud). The proper place of the form figured by Roché (1943, pl. I, fig. 3) is uncertain, because the specimen lacks the last part of the body-chamber.

Distribution: *L. (Cleistosphinctes) cleistus* was described by Buckman from the Subfurcatum Zone of Sherborne (Dorset, Southern England). The subsequent records from the Mediterranean region also refer to the Subfurcatum Zone. The Gyenespuszta specimens were collected from Bed 16 of Profile VI (Subfurcatum and Garantiana Zones).

Vermisphinctes (Vermisphinctes) martinsi (d'Orbigny, 1846)

Pl. XXV, fig. 1

1846. *Ammonites Martinsi* d'Orbigny — d'Orbigny (1842–51), p. 381, pl. 125, figs. 1–2 (only).
non 1899. *Perisphinctes Martiusi* d'Orb. — Siemiradzki, p. 327, pl. XXIV, fig. 38, text-fig. 83.
non 1908. *Perisphinctes Martiusi* d'Orb. — Borissiak, p. 21, pl. II, fig. 13, pl. V, fig. 15.
non 1909. *Perisphinctes Martinsi* d'Orbigny — Lissajous (1907–12), p. 333, pl. 6, fig. 3.
non 1911. *Perisphinctes Martiusi* d'Orbigny sp. — Flamand, p. 889, pl. IV, figs. 3–4.
non 1923. *Perisphinctes Martiusi* d'Orb. sp. — Fallot–Blanchet, p. 105, pl. I, fig. 10, text-fig. 2.
non 1924. *Bigotites Martiusi* d'Orbigny — Bentz, p. 179, pl. 8, figs. 5–6.
non 1927. *Perisphinctes Martiusi* d'Orbigny — Roman–Pétouraud, p. 42, pl. V, figs. 1–5, text-fig. 8.
non 1927. *Bigotites Martiusi* d'Orb. — Dorn, p. 243, pl. 7, fig. 1, text-fig. 12.
non 1928. *Perisphinctes Martiusi* d'Orb. — Sayn–Roman, p. 54, pl. V, fig. 7.
non 1931. *Bigotites martiusi* Orb. — Schmidtill–Krumbeck, p. 883, pl. 86, fig. 5.
1935. *Perisphinctes Martiusi* d'Orbigny — Roman, p. 24, pl. IV, fig. 3.
non 1935. *Perisphinctes Martiusi* d'Orb. sp. — Bircher, p. 142, pl. X, figs. 1–3, text-fig. 19.
non 1937. *Bigotites martiusi* Btz. n. var. — Wetzel, p. 97, pl. X, fig. 14.
non 1956. *Procerites martiusi* d'Orb. — Kakhadze–Zesashvili, p. 30, pl. V, fig. 1.
non 1964b. *Leptosphinctes* (s.s.) aff. *martinsi* (d'Orbigny) — Sturani, p. 31, pl. IV, fig. 6, text-figs. 25–28.
1970. *Vermisphinctes martinsi* (d'Orb.) — Galácz, p. 119.
non 1971. *Spathia martinsi* d'Orb. — Maxim et al., p. 426, pl. XXXII, fig. 3.
non 1976. *Bigotites martiusi* (d'Orb.) — Wormbs, pl. V, fig. 7.

Material: Two relatively well-preserved specimens.
Dimensions: J9404: 86; 24 (28); 21 (24.5); 43 (50)

Description: The figured specimen is a nearly complete internal cast with some remains of the test. The umbilicus is wide, the oblique umbilical wall is moderately high, the umbilical margin is rounded. The whorl-sides are flattened, and meet the arched venter with rounded ventrolateral edges. The whorl-section is high-oval, somewhat angular, with maximal width at the median whorl-height. The dense, sharp, slightly prorsiradiate primary ribs arise on the umbilical slope, and branch into 2 or 3 secondaries at the upper third of the flanks. The secondary ribs are also prorsiradiate and cross the venter without interruption. Primary ribs 54 in number on the last whorl. The whorls bear 3 deep, curved and projected constrictions, which are bordered by slightly swollen edges. On the internal cast the ornamentation is markedly weaker, i.e. the secondaries tend to fade on the last whorl, only the primary ribs and the constrictions persist until later. On the figured specimen the body-chamber begins at about 55 mm, aperture and sutures not seen.

Remarks: *Vermisphinctes martinsi* is a species much debated in several respects. The correct spelling of the specific name and the apertural morphology were cleared by ARKELL (1951—59, p. 168) and STURANI (1964b, pp. 31—33). Accordingly, the specific name is *martinsi* (instead of *martiusi*), and the species should be regarded as a form with lappets. Until quite recently, practically all of the Upper Bajocian perisphinctids have been recorded as *Perisphinctes Martinsi*, this being a species of common record. On the other hand, true *V. (V.) martinsi* figures are rare in the literature. The specimen of SIEMIRADZKI (1899, pl. XXIV, fig. 38) is an inner whorl and corresponds perfectly to the young whorls of *Leptosphinctes (L.) coronarius* BUCKMAN (1909—30, pl. 202). The figures of BORISSIAK (1908, pl. II, fig. 13, pl. V, fig. 15) show poorly preserved fragments, which—for lack of constrictions—cannot be placed into the genus *Vermisphinctes*. On the basis of its ribbing, the fragmentary specimen figured by LISSAJOUS (1907—12, pl. 6, fig. 3) is rather a *V. (Prorsisphinctes)*. FLAMAND (1911, pl. IV, figs. 3—4) figured under the name *Perisphinctes martiusi* different, probably Aalenian ammonites. The specimen from Spain (FALLOT and BLANCHET 1923, pl. I, fig. 10) is a closely allied form, but the convex whorl-sides show resemblance rather to *V. vermiformis* BUCKMAN. From the two forms figured by BENTZ (1925, pl. 8, figs. 5—6) that on pl. 8, fig. 5 is a coarsely ribbed form with coronate inner whorls, presumably from the genus *Leptosphinctes* (see PAVIA 1972, p. 129). The other specimen (BENTZ 1925, pl. 8, fig. 6) was regarded by WETZEL (1937) as a distinct form ("*Bigotites martiusi* BTZ. n. var.", pl. X, fig. 14). On the basis of its projected secondary ribs and tubercules at the furcation points, this form would belong to the genus *Bigotites*, though it lacks the ventral sulcus. The forms figured by ROMAN and PÉTOURAUD (1927, pl. V, figs. 1—5, text-fig. 8) were reinterpreted by ARKELL (1956, p. 77) and PAVIA (1972, p. 128). Another, more probable interpretation is as follows:

pl. V, figs. 1, 3 = *Vermisphinctes (Prorsisphinctes) helveticus* MAUBEUGE, 1961
pl. 5, fig. 2 = *Leptosphinctes (Cleistosphinctes) cleistus* BUCKMAN, 1920
pl. V, fig. 4 = *Bigotites curvatus* (BUCKMAN, 1927)
pl. V, fig. 5 = *Leptosphinctes (Cleistosphinctes) otiophorus* (BUCKMAN, 1920)
text-fig. 8 = *? Caumontisphinctes (Infraparkinsonia)* sp.

The form in SAYN and ROMAN (1928, pl. V, fig. 7) is a specimen of *V. (Prorsisphinctes) leederi* (TRAUTH). DORN (1927, pl. 7, fig. 1, text-fig. 12) figured a specimen, which lacks constrictions, and thus cannot be included in the genus. On the other hand, the figures of SCHMIDTILL and KRUMBECK (1931, pl. 86, figs. 5a-b) show a *Vermisphinctes*, but with irregular ribbing and convex whorl-sides, which are not characteristic features of *V. martinsi*. Under the name *Perisphinctes martiusi*, BIRCHER (1935, p. 142, pl. X, figs. 1—3) figured three ammonites. The two smaller specimens (pl. X, figs. 2—3) are certainly *Cleistosphinctes* (see PAVIA 1972, p. 129), the larger one is a typical *Leptosphinctes* of the *davidsoni-coronarius* group. KAKHADZE and ZESASHVILI (1956, pl. V, fig. 1) figured an evolute, weakly-ribbed specimen, which is close to *V. (Prorsisphinctes) pseudofrequens* (SIEMIRADZKI). MAXIM et al. (1971, p. 426, pl. XXIII, fig. 3) described and figured from the Bathonian of Swinitza a specimen, which is—as far as one can judge from the extremely poor photographs—a *Siemiradzkia*.

V. (V.) martinsi differs from the other congeneric forms by its flattened whorl-sides, narrow venter and straight, sharp ribbing. Having these characters, the Gyenespuszta specimens show striking resemblance to the type of D'ORBIGNY.

Distribution: Despite the several misinterpretations, *V. martinsi* seems to be a common form in the Upper Bajocian horizons, both in NW Europe and the Mediterranean. At Gyenespuszta the two specimens have come from Bed 15 of Profile VI, i.e. from the lower part of the Parkinsoni Zone.

Vermisphinctes (Prorsisphinctes) stomphus (Buckman, 1921)

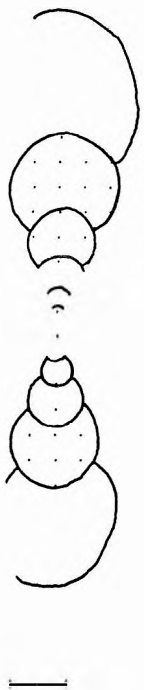
Pl. XXV, fig. 2, Pl. XXVI, fig. 1, Text-figs. 88, 89

1921. *Stomphosphinctes stomphus*, nov. — Buckman (1909—30), pl. 247, figs. 1—2.
1970. *Leptosphinctes* cf. *coronoides* Buckman — Galácz, p. 118.
1972. *Leptosphinctes (Prorsisphinctes) stomphus* Buckman — Krystyn, p. 268, pl. 9, fig. 1, text-figs. 20, 23.

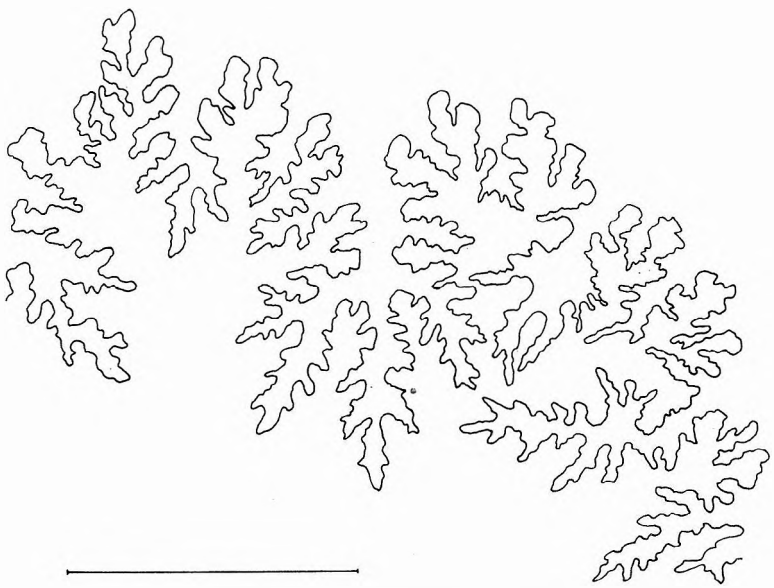
Material: Three well-preserved and four fragmentary internal moulds.

Dimensions:				
J9406:	177;	46 (26);	38 (21.5);	100 (56.5)
J9407:	115;	33 (29);	?34 (?29.5);	59 (51)
J9405:	100;	31 (31);	31 (31);	48 (48)

Description: The figured specimen is a large, well-preserved and entire internal cast. The umbilicus is wide, the umbilical wall is moderately high, convex, the umbilical edge is rounded. The whorl-sides are flattened, the venter is narrowly arched. The whorl-section is high-oval, somewhat angular, with maximal thickness near the lower third of the flanks. The prorsiradiate, slightly curved primary ribs emerge from the umbilical edge, and branch into 2 or 3 secondaries near the ventrolateral edge. The prorsiradiate secondaries cross the venter without interruption. On the body-chamber the ribbing becomes more widely-spaced and weaker, but persists up to the aperture. The body-chamber begins at about 110 mm diameter, and comprises the whole last whorl. The aperture is simple, with projected peristomal margin, and is bordered by a wide constriction. There are 3 strong, prorsiradiate constrictions on every whorl.



Text-fig. 88. Whorl-section of *Vermisphinctes (Prorsisphinctes) stomphus* (J9407), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 89. Suture-line of *Vermisphinctes (Prorsisphinctes) stomphus* (J9405), VI/16, Subfurcatum and Garantiana Z.

The suture-line (Text-fig. 89) is well-differentiated, with narrow and deep E and strongly retracted auxiliaries.

Remarks: On the basis of the dimensions and the style of ribbing, the Gyenespuszta specimens agree well with the type figured by Buckman. There is some difference in the strength of ribbing, but the specimens described here are internal moulds, and as shown by the figure of the holotype (Buckman 1909—30, pl. 247, fig. 2), the ribs under the test are weaker.

Distribution: The type was described by Buckman from the Garantiana Zone of Southern England. Similar forms have been recorded from the Garantiana Zone of NW Germany (Wetzel 1937, p. 103), and from the Parkinsoni Zone of Northern Italy (Sturani 1964b, p. 29). The Austrian specimen figured by Krystyn (1972, pl. 9, fig. 1) came also from the Parkinsoni Zone. The Gyenespuszta specimens have been yielded by Bed 16 (Subfurcatum and Garantiana Zones) of Profile VI.

Vermisphinctes (Prorsisphinctes) pseudofrequens (Siemiradzki, 1899)

Pl. XXVII

1899. *Perisphinctes pseudofrequens* n. sp. — Siemiradzki, p. 235, pl. XXI, fig. 12, text-fig. 46.
non 1923. *Perisphinctes* (s. str.) cf. *pseudofrequens* Siemiradzki — Lissajous, p. 70, pl. X, fig. 4.
non 1969. *Perisphinctes pseudofrequens* Siemiradzki — Mihailovič, p. 76, pl. XIV, figs. 2, 3, 3a.
1972. *Leptosphinctes (Prorsisphinctes) pseudofrequens* (Siemiradzki) — Krystyn, p. 235, pl. 10, fig. 1, text-figs. 20, 22.

Material: One, relatively well-preserved specimen.
Dimensions: J9408: 200; 53 (26.5); 50 (25); 103 (53)

Description: The middle-whorls of the specimen are coated by ferro-manganese, the last whorl is broken off and partly dislocated. It is a large adult specimen, with a wide umbilicus, a high and convex umbilical wall, a rounded umbilical edge, convergent whorl-sides and a highly-arched venter. The dense ribbing comprises forwards-curved primary ribs, which bi- or trifurcate near the upper third of the flanks. The number of the primary ribs on the penultimate whorl is 44. The ribbing tends to fade on the body-chamber, i.e. the secondaries die out about 155 mm. There are 3 wide and shallow constrictions on the whorls. The aperture is simple, with a smooth peristome. Because of the ferro-manganese incrustation, the suture-lines are not visible.

Remarks: The Gyenespuszta specimen agrees well with the type, but the latter has somewhat a narrower umbilicus and denser ribbing. Distinguishing features seem to be the bi- or trifurcating ribs fading out on the last whorl and the shallow constrictions. The Bathonian form figured by Lissajous (1923, pl. X, fig. 4) is probably a *Gracilisphinctes*. The large phragmocone described by Krystyn (1972, pl. 10, fig. 1) seems to be conspecific. Krystyn mentioned bifurcating ribbing, but his figure clearly shows trifurcations too. Mihailovič (1969, pl. XIV, figs. 2—3) figured two Lower Bathonian *Siemiradzkia* specimens under the name *P. pseudofrequens*.

Distribution: The holotype came from condensed Upper Bajocian near Bayeux (see Krystyn 1972, p. 268). Subsequent records (Wetzel 1937, p. 113 and Krystyn 1972) refer to Parkinsoni Zone occurrences. The Gyenespuszta specimen has come from Bed 16 of Profile VI, i.e. from the Subfurcatum and Garantiana Zones.

Vermisphinctes (Prorsisphinctes) sp.

Pl. XXIX, fig. 1

cf. 1927. *Prorsisphinctes meseres* S. Buckman 1923 — Buckman (1909—30), pl. 446A-B (only).
1970. *Leptosphinctes (Prorsisphinctes)* sp. aff. *meseres* Buckman — Galácz, p. 118.

Material: One large internal mould.
Dimensions: J9409: 290; 78 (27); ?46 (?16); 160 (55)
225; 53 (23.5); ?42 (?19); 126 (56)

Description: A large, evolute form with a wide and shallow umbilicus. The umbilical wall is low and convex, the umbilical edge is rounded. The whorl-sides are convex on the inner and middle whorls, but flattened on the body-chamber. The ventrolateral edge is rounded, the venter is arched. The whorl-section is elliptically shaped, with maximal thickness at the middle of the flanks. The strong, forwards-curved primary ribs arise at the umbilical wall and branch into two secondary ribs at the upper third of the flanks. On the specimen the secondaries are visible only on the last whorl, here these are low and prorsiradiate, and fade gradually towards the peristome. Near the peristome the primary ribs die out, too. The number of primary ribs on the penultimate whorl is 58. The body-chamber begins at about 250 mm diameter. On every whorl 3 wide, deep constrictions appear, which have a swollen anterior margin. The specimen lacks the apertural part, the entire suture-line not being seen.

Remarks: This is one of the largest ammonite specimens of the Gyenespuszta fauna. Only some *Phylloceras* and *Lytoceras* specimens exceed it in size. The single, previously figured similar form is *Prorsisphinctes meseres* Buckman 1927, non 1923, from the Parkinsoni Zone. This specimen differs from the holotype of *P. meseres* in having more widely spaced and sharper ribbing, greater size and more robust whorls. Besides some similarities, the Gyenespuszta specimen shows essential differences too: wider umbilicus, thinner whorls and stronger constrictions.

Distribution: The Gyenespuszta specimen has come from Bed 16 of Profile VI (Subfurcatum and Garantiana Zones).

Vermisphinctes (Prorsisphinctes) leederi (Trauth, 1923)

Pl. XXVIII, fig. 2

1923. *Perisphinctes Leederi* Trth. n. sp. — Trauth, p. 235, pl. II, figs. 7a-b.
1928. *Perisphinctes Martiusi* d'Orb. — Sayn—Roman, p. 54, pl. V, fig. 7 (only).
1970. *Leptosphinctes (Prorsisphinctes) leederi* (Trauth) — Galácz, p. 119.

Material: A single, relatively well-preserved specimen.
Dimensions: J9400: 81; 25 (31); 25.5 (31.5); 40 (49.5)

Description: Medium-sized specimen with a wide umbilicus, a rounded umbilical edge, a circular whorl-section, convex whorl-sides and a widely-arched venter. The maximal width lies at the middle of the flanks. The dense, blunt, rectiradiate primary ribs arise on the umbilical wall and bifurcate at the upper third of the flanks. The secondaries swing slightly forward and cross the venter without interruption. The number of primary ribs on the last whorl is 54. There are two deep, curved, projected constrictions per whorl. The body-chamber begins at about 50 mm, the apertural part is broken off. Sutures not seen.

Remarks: On the basis of its whorl-section, ribbing and constrictions, this species, described by Trauth, can be assigned to the subgenus *Prorsisphinctes*. A conspecific form is that figured under the name *Perisphinctes Martiusi* by Sayn and Roman (1928, pl. V, fig. 7). A closely allied species was described as *Leptosphinctes helveticus* n. sp. by Maubeuge (1961, pp. 154—155) from the Grober Oolith of Switzerland. This latter form, however, differs by its narrower umbilicus and shallower constrictions.

Distribution: The type of *V. (P.) leederi* was described from Austria, from supposed Lower Bathonian strata. The subgenus *Prorsisphinctes*, however, is restricted to the Upper Bajocian. The age of the specimen of Sayn and Roman from the Rhone Valley is also Upper Bajocian. The Gyenespuszta specimen has come from Bed 15, i.e. from the lower part of the Parkinsoni Zone of Profile VI.

Vermisphinctes (Prorsisphinctes) cf. limnioticus (Buckman, 1925)

Pl. XXVIII, fig. 1

1925. *Glyphosphinctes limnioticus*, nov. — Buckman (1909—30), pl. 514A-B.

Material: A single fragment of a large, poorly preserved specimen.

Description: The specimen is a quarter of a whorl fragment of the end of a large ammonite, with a piece of the phragmocone. The coiling is moderately evolute, the whorl-section is high-oval, somewhat angular. The umbilical margin is rounded. The ribbing on the body-chamber is widely-spaced, the ribs are blunt, strong, slightly proverse. The primary ribs bifurcate at the middle of the flanks, and the secondary ribs, which are flattened on the venter, cross it without interruption. The apertural part of the body-chamber is poorly preserved, the projected, narrowly collared peristome is poorly visible. The suture-lines cannot be studied.

Remarks: Buckman (1909—30) described several large perisphinctids from the Parkinsoni Zone. Among these, the fragmentary Gyenespuszta specimen with its moderately evolute coiling and coarse ribbing shows great resemblance to *V. (Prorsisphinctes) limnioticus*. On the basis of its relatively narrow umbilicus and widely-spaced ribs, this species differs from the more evolute *V. (P.) stomphus* (Buckman) on the one hand, and the densely ribbed *V. (P.) meseres* Buckman, on the other. For lack of the inner whorls of the Gyenespuszta specimen, it is doubtful whether this belongs to another species known so far from inner whorls. On the basis of the type figures, it is possible that a larger material proves the synonymy of *V. (P.) limnioticus* and of such species as *L. (P.) venetus* Sturani.

Distribution: The holotype came from the Parkinsoni Zone of Dorset (Southern England). The Gyenespuszta specimen has been yielded by the upper part of this same zone (Bed 13 of Profile VI).

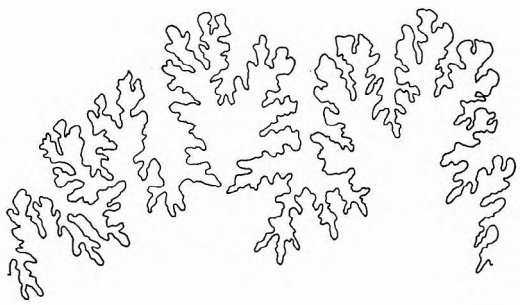
Vermisphinctes (Prorsisphinctes) venetus Sturani, 1964

Pl. XXV, fig. 5, Text-fig. 90

?1963. *Perisphinctes defrancei* (Orbigny) — Azarian, p. 211, pl. VII, fig. 6.
1964b. *Leptosphinctes (Prorsisphinctes) venetus* n. sp. — Sturani, p. 30, pl. IV, fig. 2, text-fig. 23.
1970. *Leptosphinctes (Prorsisphinctes) venetus* Sturani — Galácz, p. 119.
1972. *Leptosphinctes (Prorsisphinctes) venetus* Sturani — Krystyn, p. 266, pl. 8, fig. 6.

Material: A single, well-preserved internal mould.
Dimensions: J9411: 73; 21 (29); 22 (30); 39 (53)

Description: A medium-sized specimen with a wide, shallow umbilicus, a high, convex umbilical wall and a rounded umbilical edge. The whorl-sides are convex and round evenly into the widely-arched venter. The whorl-section is circular, with maximal thickness at the middle of the flanks. The strong, blunt primary ribs are radiate, bifurcating at the outer third of the whorl-height. The secondaries cross the venter without interruption. On the last preserved whorl the number of the primaries is 46. The wide, deep, prorsiradiate constrictions appear at every 250° of the whorls. The body-chamber begins at 65 mm diameter. A part of the body-chamber is broken away, thus the aperture is unknown.



Text-fig. 90. Suture-line of *Vermisphinctes (Prorsisphinctes) venetus* (J9411), VI/13, Parkinsoni Z.

The suture-line (Text-fig. 90) is well-differentiated. E is deep and narrow, L is asymmetrically three-pronged. The auxiliaries are heavily retracted. The saddles are high and wide and asymmetrically divided.

Remarks: On the basis of its dimensions, ribbing and suture-line, the Gyenespuszta specimen agrees with the type. According to the original description by Sturani (1964b, pp. 30–31), *V. (P.) venetus* differs from the other *Prorsisphinctes* by its strong ribbing and circular whorl-section. A similar form from the Parkinsoni Zone is the species *V. (P.) hoffmanni* (Gemmellaro), but this latter has denser and finer ribbing. *V. (P.) leederi* (Trauth) has a narrower umbilicus and prorsiradiate ribbing, while *V. (P.) reparator* (Buckman) shows shallower constrictions and denser ribbing. Probably conspecific is the specimen described as *Perisphinctes defrancei* by Azarian (1963, pl. VII, figs. 6a-b) from the Upper Bajocian of Armenia.

Distribution: The type of this species came from the Upper Bajocian Parkinsoni Zone of Northern Italy. The Austrian specimen figured by Krystyn (1972) was also collected from the Parkinsoni Zone. Hitherto known from Mediterranean localities, the species has been recovered at Gyenespuszta from Bed 13, i.e. from the upper part of the Parkinsoni Zone of Profile VI.

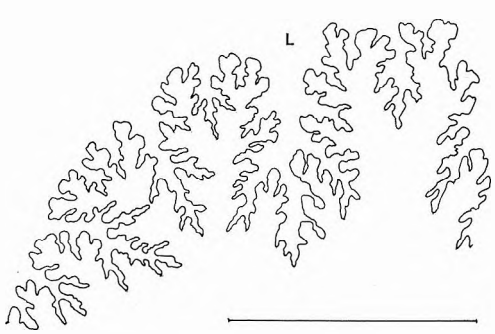
Vermisphinctes (Prorsisphinctes) hoffmanni (Gemmellaro, 1877)

Pl. XXV, fig. 3, Text-fig. 91

1877. *Perisphinctes Hoffmanni* Gemm. — Gemmellaro, p. 70, pl. IV, figs. 6–7.
1964b. *Leptosphinctes* (s.s.) *hoffmanni* (Gemmellaro) — Sturani, p. 34, pl. IV, fig. 4, text-fig. 29
1970. *Leptosphinctes (L.) hoffmanni* (Gemm.) — Galácz, p. 119.

Material: One well-preserved and two fragmentary internal mould.
Dimensions: J9413: 123; 36 (28.5); ?30 (?24.5); 60 (49)
J9412: 63; 19 (30); 17 (27); 30 (48)

Description: The specimen figured here on Pl. XXV, fig. 3 is a well-preserved internal mould of medium size. The umbilicus is wide and shallow. The umbilical slope is low, slightly convex, the umbilical edge is rounded. The flanks are gently convex, the venter is narrow and highly arched. The whorl-section is high-oval, with maximal thickness at the lower third of the flanks. The low, dense, rectiradiate primary ribs emerge from the umbilical wall. Near the middle of the flanks the primary ribs are bi- or trifurcate. There are 29 primaries on the last half whorl. The number of the strong, wide, prorsiradiate constrictions is 2 per whorls. This figured, smaller specimen is septate up to about 60 mm diameter, on the other, larger specimen the body-chamber begins at 120 mm diameter. The ribbing of the body-chamber is similar to that on the phragmocone. No apertural part is preserved on the available specimens.



Text-fig. 91. Suture-line of *Vermisphinctes (Prorsisphinctes) hoffmanni* (J9412), VI/15, Parkinsoni Z.

The suture-line (Text-fig. 91) is well-differentiated. E is deep, L is somewhat shorter and threepronged. The suspensive lobe is heavily retracted.

Remarks: On the basis of their size, dimensions, ribbing and sutures, the Gyenespuszta specimens are in good agreement with the lectotype of *V. (P.) hoffmanni* (Gemmellaro 1877, pl. IV, fig. 6; designated by Sturani 1964b, p. 34), and with the specimen figured

by STURANI (loc. cit., pl. IV, fig. 4). The nucleus of this species lacks the tubercules in the row of bifurcation, therefore it should be assigned rather to the subgenus *Prorsisphinctes*.

Distribution: This species was described from Mediterranean localities (Sicily, Southern Alps), from the Upper Bajocian. On the other hand, SIEMIRADZKI (1899, p. 328) and WETZEL (1924, p. 225) mentioned it from the Lower Bathonian of Bayeux and Nièvre, respectively, but for lack of figures, these records should be regarded as doubtful. The Gyenespuszta specimens have come from the lower part of the Parkinsoni Zone (Bed 15 of Profile VI).

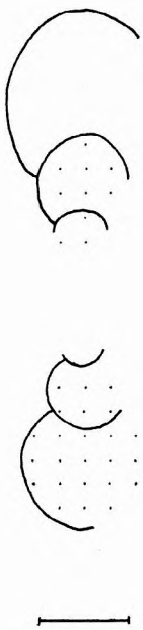
Bigotites (Bigotites) curvatus (BUCKMAN, 1927)

Pl. XXV, fig. 6, Text-figs. 92, 93

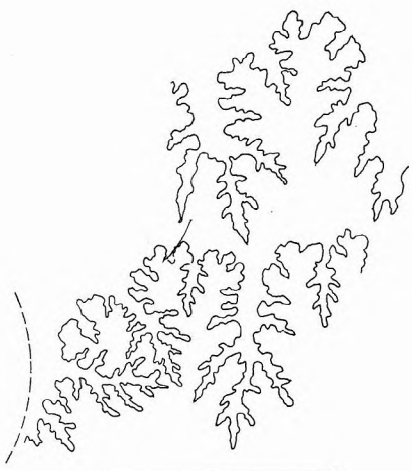
1927. *Bajocisphinctes curvatus*, nov. — BUCKMAN (1909—30), pl. 726, figs. 1—2.
1927. *Perisphinctes Martiusi* D'ORBIGNY — ROMAN—PÉTOURAUD, p. 42, pl. V, fig. 4 (only).
1970. *Bigotites* sp. — GALÁCZ, p. 118 (pars).

Material: Three fragmentary specimens.
Dimensions: J9415: 65; 22 (34); 18 (23); 30 (46)
J9414: 54; 19 (35); ?18 (?33); 22 (41)

Description: The figured specimen is a small internal cast, with a narrow umbilicus, a low umbilical slope, convex whorl-sides and a highly-arched venter. The whorl-section (Text-fig. 92) is high-oval, with maximum thickness near the lower third of the flanks. The short, sharp, forwards-curved primary ribs emerge from the umbilical slope and branch into three heavily projected secondary ribs, which fade away on the venter, resulting in a smooth ventral band. There are two strong



Text-fig. 92. Whorl-section of *Bigotites (B.) curvatus* (J9415), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 93. Suture-line of *Bigotites (B.) curvatus* (J9414), VI/16, Subfurcatum and Garantiana Z.

constrictions per whorl. The body-chamber of the figured specimen begins at 42 mm diameter, but another specimen in the material shows septation up to 60 mm diameter. Apertural part not preserved.

The suture-line (Text-fig. 93) is relatively simple and agrees well with that on the figures of BUCKMAN (1909—30, pl. 726).

Remarks: Despite their poor preservation, the Gyenespuszta specimens show close resemblance to BUCKMAN's type figures. Another conspecific form is one of the perisphinctids figured by ROMAN (in ROMAN and PÉTOURAUD 1927, pl. V, fig. 4) from the Upper Bajocian of Ciret (E France). This specimen was regarded first by ARKELL (1956, p. 77) as a *Vermisphinctes*, and then by PAVIA (1972, p. 131) as *Leptosphinctes (Prorsisphinctes) ultimum* (KAKHADZE et ZESASHVILI). Despite the imperfect illustration, this form can be rather a *B. curvatus* specimen.

Distribution: The holotype was described by BUCKMAN from the Garantiana Zone of Dorset (Southern England). The specimen of ROMAN and PÉTOURAUD was also collected from the Garantiana Zone (see ARKELL 1956, p. 77). The Gyenespuszta specimens have come from Bed 16 (i.e. Subfurcatum and Garantiana Zones) of Profile VI.

Bigotites (Bigotites) lanquinei (NICOLESCO, 1916)

Pl. XXVI, fig. 3

1916. *Bigotella Lanquinei* n. sp. — NICOLESCO, p. 173, pl. 4, fig. 7.
1930. *Perisphinctes (Bigotites) Lanquinei* NICOLESCO — ROMAN, p. 18, pl. VII, fig. 3.
1931. *Bigotites Lanquinei* NICOLESCO — NICOLESCO, p. 28, pl. IV, figs. 5—6, pl. V, figs. 1—2.
?1935. *Bigotites* cf. *lanquinei* NICOLESCO — ROMAN, p. 23, pl. IV, fig. 1.
1970. *Bigotites lanquinei* NICOLESCO — GALÁCZ, p. 118.
1972. *Bigotites lanquinei* (NICOLESCO) — PAVIA, p. 137, pl. 28, fig. 10.

Material: A single, fragmentary internal cast.
Dimensions: J9421: 52; 15.5 (30); 15 (29); 25 (48)

Description: Small specimen with an open umbilicus, a relatively high umbilical wall and a rounded umbilical edge. The whorl-section is somewhat angular, with an arched venter and flattened whorl-sides. The prorsiradiate primary ribs, 42 in number on the last whorl, arise at the umbilical wall. The primaries branch into two secondary ribs near the ventrolateral edge. The secondaries and the appearing intercalatories are more prorsiradiate. The smooth ventral band is quite distinct. There are 3 constrictions per whorl, but these—because of the poor preservation—are hardly visible. Sutures not decipherable.

Remarks: On the basis of the coiling, and of the style and density of the ribbing, the Gyenespuszta specimen shows close resemblance to the type, but its whorls are somewhat narrower. From the forms figured in the literature, that of Privas (ROMAN 1935, pl. IV, fig. 1), with its rounded whorl-sides and its lack of the smooth ventral band, is probably not conspecific, not even congeneric *(? Vermisphinctes)*.

Distribution: The type came from the Garantiana Zone of Sully (Normandy). There are occurrences in NW Germany (WETZEL 1937, p. 95) and in the Mediterranean region (ROMAN 1930; PAVIA 1972). The Gyenespuszta specimen has been collected from Bed 16 of Profile VI (=Subfurcatum and Garantiana Zones).

Bigotites (Bigotites) tuberculatus (NICOLESCO, 1916)

Pl. XXIX, fig. 2, Text-figs. 94, 95

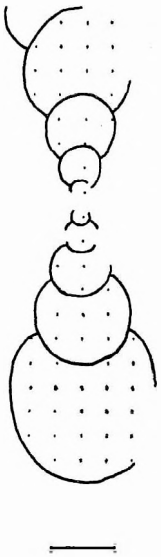
1916. *Bigotella tuberculata* n. sp. — NICOLESCO, p. 162, pl. 4, fig. 2.
1931. *Bigotites tuberculatus* NICOLESCO — NICOLESCO, p. 19, pl. 1, figs. 2—4.
1970. *Bigotites* spp. — GALÁCZ, p. 118 (pars).
1972. *Bigotites tuberculatus* (NICOLESCO) — PAVIA, p. 136, pl. 28, fig. 9.

Material: A single specimen, relatively well-preserved, but fragmentary.
Dimensions: J9416: 98; 28 (28.5); 26 (26.5); 47 (48)

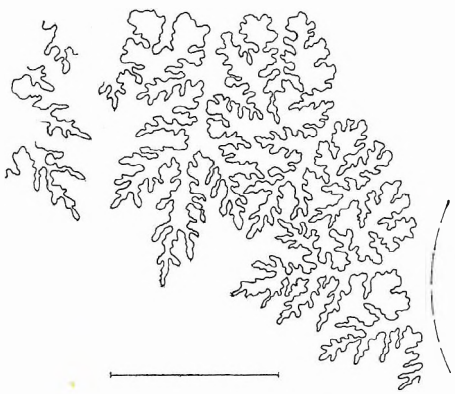
Description: Medium-sized, fragmentary internal mould, with a shallow and wide umbilicus, a low umbilical wall and a rounded umbilical edge. The whorl-section is rounded, with convex whorl-sides and a widely-arched venter. The maximal thickness lies at the lower third of the flanks. The blunt, thick primary ribs are slightly curved forward and branch at the upper third of the flanks. Because of the preservation, the secondary ribs are hardly visible, but the small tubercules of the furcation points are quite distinct. The deep, narrow constrictions appear better on the inner whorls of better preservation. The fragment is septate entirely, thus the features of the body-chamber and the aperture cannot be studied.

The suture-line is finely differentiated (Text-fig. 95), L is long and narrow, the auxiliaries are retracted.

Remarks: *Bigotites tuberculatus* differs from the other congeneric forms with its wider umbilicus, denser ribbing and lateral tubercules. In his second work on the genus, NICOLESCO (1931) figured two other morphotypes in addition to the holotype. The one in pl. I, fig. 2 is a densely ribbed inner whorl, the other in pl. I, fig. 4 is a larger specimen with a narrower umbilicus. This latter specimen was regarded by WETZEL (1937, pp. 93—94) as a distinct form, but PAVIA (1972, pp. 136—137) confirmed the original concept. On the basis of its coiling and ribbing, the Gyenespuszta specimen is



Text-fig. 94. Whorl-section of *Bigotites (B.) tuberculatus* (J9416), VI/16, Subfurcatum and Garantiana Z.



Text-fig. 95. Suture-line of *Bigotites (B.) tuberculatus* (J9416), VI/16, Subfurcatum and Garantiana Z.

intermediate between the holotype and the larger specimen of NICOLESCO, thus corroborating the conspecific state of the NICOLESCO figures.

Distribution: The type came from the Garantiana Zone of Normandy, and WETZEL and later PAVIA recorded their specimens from the Tetragona Subzone of the Garantiana Zone of NW Germany and SE France, respectively. The Gyenespuszta specimen has come from Bed 16 (Subfurcatum and Garantiana Zones) of Profile VI.

Bigotites (Bigotites) hodicus (NIKANOROVA, 1972)

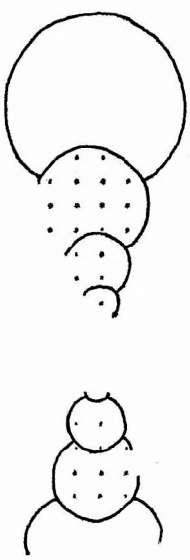
Pl. XXVI, fig. 2, Text-fig. 96

1970. *Bigotites* spp. — GALÁCZ, p. 118 (pars).
1972. *Leptosphinctes hodicus* NIKANOROVA sp. nov. — NIKANOROVA, p. 68, pl. II, fig. 4, pl. III, fig. 1.

Material: 4 relatively well-preserved and 4 fragmentary specimens.

Dimensions:					
J9417:	80;	23 (29);	?24	(?30);	42 (52.5)
J9418:	75;	22 (29);	21	(28);	38 (51)
J9420:	57;	19 (33);	?17	(?30);	28 (49)
J9419:	47;	14 (30);	13.5	(29);	25 (53)

Description: The figured form is a fragmentary, but otherwise well-preserved specimen, with parts of the recrystallized shell. The umbilicus is considerably wide, shallow, with a low and convex umbilical slope. The whorl-section (Text-fig. 96) is high-oval, with convex whorl-sides and a widely-arched venter. The maximal width lies at the middle of the flanks. The strong, straight, slightly prorsiradiate primary ribs emerge from the umbilical wall. The primaries branch into two secondary ribs at the upper third of the flanks. The secondaries are interrupted on the venter, thus a smooth ventral band appears on the periphery. The number of the primary ribs is 51 on the last whorl. The strong and deep constrictions occur at every half of a whorl, the ir anterior border being heavily swollen. The figured specimen is septate up to about 55 mm, but, for lack of the aperture, the length of the body-chamber cannot be indicated. On the available specimens no septal sutures visible.



Text-fig. 96. Whorl-section of *Bigotites (B.) hodicus* (J9418), VI/16, Subfurcatum and Garantiana Z.

Remarks: *B. hodicus* was originally ascribed to the genus *Leptosphinctes* by its author, NIKANOROVA (1972, p. 68). However, by the style of ribbing and constrictions, and the presence of ventral smooth band, this species clearly belongs to the genus *Bigotites*. It differs from other *Bigotites* species by its more slender whorls, wider umbilicus and denser ribbing. The Gyenespuszta specimens agree well with the holotype (NIKANOROVA 1972, pl. III, figs. 1a-b).

Distribution: The type came from the Upper Bajocian Subfurcatum Zone of the Caucasus. The Gyenespuszta specimens occur in Bed 16 of Profile VI, i.e. in the Subfurcatum and Garantiana Zones.

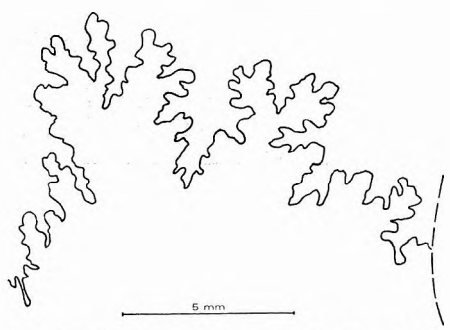
Bigotites (Bigotites) bajociensis (SIEMIRADZKI, 1899)

Pl. XXV, fig. 4, Text-fig. 97

1899. *Perisphinctes Bajociensis* n. sp. — SIEMIRADZKI, p. 334, pl. XXIV, fig. 40, text-fig. 85.
1927. *Bajocisphinctes bajociensis*, SIEMIRADSKI, sp. — BUCKMAN (1909—30), pl. 713, figs. 1—2.
1970. *Bajocisphinctes bajocensis* (SIEM.) — GALÁCZ, p. 119.
1974. *Bajocisphinctes bajociensis* (SIEMR.) — DIETL, p. 13, pl. 3, fig. 2, text-fig. 6.

Material: A single, poorly preserved internal mould.
Dimensions: J9422: 80; 26 (32.5); ?22 (?27.5); 35 (44)

Description: A medium-sized form (max. diameter 94 mm), with a wide umbilicus. The umbilical slope is low, the whorl-sides on the inner whorls are convex, but on the body-chamber are flattened. The whorl-section is high, subtriangular, with a narrow venter. The widely-spaced and short primary ribs are curved forwards and branch into three projected secondaries at the lower third of the flanks. Because of the poor state of preservation, the style of the secondary ribbing on the venter cannot be seen. The specimen is septate up to about 65 mm diameter, the length of the preserved body-chamber part being 4/5 of a whorl.



Text-fig. 97. Suture-line of *Bigotites (B.) bajociensis* (J9422), VI/15, Parkinsoni Z.

The suture-line (Text-fig. 97) is simple, and is characterized by a comparatively less retracted suspensive lobe. In this respect, the suture is rather parkinsoniid in appearance.

Remarks: The type specimen of *B. bajociensis* (SIEMIRADZKI, 1899, pl. XXIV, fig. 40) is an entirely preserved ammonite with a somewhat contracted body-chamber, a simple suture-line and with parts of a preserved shell. The ribbing is weaker on the body-chamber, but it persists up to the aperture. The specimens figured by BUCKMAN (1909—30, pl. 713) and DIETL (1974, pl. 3, fig. 2) are in good agreement with the type. The specimen found at Gyenespuszta also corresponds well with these forms, but, owing to its poor state of preservation, some features (e.g. the venter and the constrictions) cannot be studied. A closely allied species is *B. lenki* SCHMIDTILL et KRUMBECK, 1931 (p. 884, pl. 90, fig. 2), but this has a narrower umbilicus, convex whorl-sides and coarser ribs on the body-chamber.

Distribution: The specimens recorded so far came from the Garantiana Zone of NW European region. The Gyenespuszta specimen is stratigraphically a little younger, as it was found in the lower part of the Parkinsoni Zone (Bed 15 of Profile VI).

Subfamilia *Zigzagiceratinae* BUCKMAN, 1920

Genus PROCERITES SIEMIRADZKI, 1899

Type species: *Ammonites procerus* SCHLOENBACH, 1865, p. 38, pl. 30, fig. 1 (=*Am. schlönbachi* DE GROSSOUVRE 1907, p. 8) (see ARKELL 1951—59, pp. 171—173).

General remarks: The characteristic Bathonian genus *Procerites* comprises the majority of the perisphinctids of this age. The adult size of the forms assigned to it may attain gigantic dimensions, in fact, some forms exceed 400 mm in diameter (HAHN 1969). The ribbing of the inner and middle whorls comprises bi- and trifurcate ribs, which gradually die out on the outer whorls. The ribbing tends to fade in the row of furcation so that the ribs will disappear, first on the venter and later on the outer whorls. The large adult examples are generally completely smooth.

The evolution of the genus *Procerites* has some points of interest. The origin was cleared by ARKELL (1951—59, pp. 164, 234) and recently by STURANI (1966, p. 18). According to these authors,

the earliest *Procerites*, the Upper Bajocian *P. costulatosus*, is closely related to the similarly Upper Bajocian ancestral *P. (Lobosphinctes) intersertus*. This, in turn, roots back to the Bajocian genus *Bigotites*.

As was recognized by STURANI (loc. cit.), within the Digne sections (SE France), *Procerites* species are apparently absent from the Macrescens Subzone. Given this fact, STURANI suggested conditionally an unrelated origin for the Yeovilensis Subzone and Progracilis Zone *Procerites*, from an unknown perisphinctid stock. However, HAHN (1969, pp. 80—82) showed that the Macrescens Subzone of SW Germany did contain *Procerites*, although his specimens were poorly preserved, indeterminable forms.

On the other hand, a more striking gap in the *Procerites* line occurs in the higher Middle Bathonian. In the basal Middle Bathonian Progracilis Zone *Procerites* (including the subgenus *Gracilisphinctes*) occur in a relatively great frequency, but from the Subcontractus and Morrisi Zones there is no record of this genus anymore. In his monograph on the English Bathonian ammonites, ARKELL (1951—59) mentioned several "Middle Bathonian" records, but on the basis of detailed, subsequent stratigraphic evaluations by TORRENS (1967a, 1967b, 1968, 1969), Fuller's Earth and Great Oolite records turned out to be Upper Bathonian, Retrocostatum Zone occurrences. *Procerites* reappears in the Retrocostatum Zone, and these large species show a very characteristic faunal development ("large perisphinctid fauna" of TORRENS 1967a). It is interesting to note, that some *Procerites* species, first appearing in the Progracilis Zone, reappear in the basal Upper Bathonian, after a considerable hiatus, spanning two zones. *P. imitator* (BUCKMAN), which makes his first appearance in the upper Zigzag Zone (Kingswood School, Bath, Southern England: ARKELL 1951—59, pp. 11, 193, in the "*Fowleri-Fullonicus* horizon", corresponding to the Yeovilensis Subzone in age, see TORRENS 1967a, p. 12), has got its holotype from the Progracilis Zone (ARKELL, loc. cit., pl. XXVI, fig. 2). A Retrocostatum as well as an Aspidoides Zone specimen were also figured by ARKELL. Another *Procerites* species of similar, intermittent stratigraphic range is *P. quercinus* (TERQ. et JOUR.), recorded by HAHN (1969, pp. 54—55, Table 1) from the Progracilis and Retrocostatum Zones. All of the English specimens of this latter species seem to be confined to the Retrocostatum Zone.

This break of continuity in the vertical distribution of *Procerites* seems to be unexplained as yet. As a starting point, in solving problem, it would be sufficient to clear whether these basal Middle Bathonian and Upper Bathonian forms are really conspecific, or are unrelated homoeomorphs. In the first case there must be some still unknown successions, which may yield continuous *Procerites* lineages. In the case of homoeomorphy, it is necessary to search for a group, which could have given rise to these Upper Bathonian forms. The single lineage for this origination is that of the continuous Middle Bathonian *Wagnericeras (Suspensites)*.

D i s t r i b u t i o n : The representatives of the genus *Procerites* are wide-spread both in the NW European and the Mediterranean regions. The wide Tethyan distribution previously outlined, and based on earlier records, is restricted after the reevaluation of some North American occurrences by ARKELL (1951—59, pp. 164—165), nevertheless the records from the Caucasus, Iran and Madagascar seem to be justified.

D i m o r p h i s m : The only, previously suggested approach to a microconchiate match for macroconch *Procerites* is *Phaulozigzag* (ARKELL 1951—59, p. 235). On the other hand, the type species of this monotypical subgenus has recently been regarded as a *Siemiradzkia procera* (SEEBACH) by HAHN (1969, p. 42). This apparently justified opinion has suggested again the possibility of the repeatedly suggested *Siemiradzkia—Procerites* microconch-macroconch match. In fact, MANGOLD (1970a, p. 222) regarded *Siemiradzkia* as unequivocal microconch counterpart of the *Procerites*. STEPHANOV (1972, pp. 21—23), however, vehemently protested against such a comparison. As a matter of fact, this match faces some difficulties on stratigraphic ground. In addition, the gap in *Siemiradzkia* distribution appears in the basal Middle Bathonian, where the second greater wave of the *Procerites* occurs.

Procerites cf. **clausiprocerus** (BUCKMAN, 1892)

Pl. XXXI, fig. 1

1892. *Stephanoceras clausiprocerus* sp. nov. — BUCKMAN, p. 452, pl. XIII, fig. 5.
1905. *Perisphinctes Moorei* OPP. var. — SIMIONESCU, p. 22, pl. II, fig. 1 (only).
1905. *Perisphinctes procerus* SEEB. — POPOVICI-HATZEG, p. 24, pl. VI, fig. 1.
1923. *Perisphinctes (Zigzagiceras) clausiprocerus* S. S. BUCKMAN — LISSAJOUS, p. 85, pl. XI, fig. 2 (only).
1925. *Zigzagiceras clausiprocerus* S. BUCKMAN sp. — BUCKMAN (1909—30), pls. 545A-B.
1957. *Procerites clausiprocerus* (S. BUCKMAN) — ARKELL (1951—59), p. 185, pl. 23, fig. 5, text-fig. 67.
1966. *Procerites (Procerites) clausiprocerus* (BUCKMAN, 1892) — CIRY—TINTANT, p. 87, pl. III, fig. 1, text-fig. 2.
1970. *Procerites* cf. *clausiprocerus* (BUCKMAN) — GALÁCZ, p. 120.

Material: One poorly preserved internal mould.
Dimensions: J9427: 138; 59 (43); ?42 (?30); 42 (30)

Description: Medium-sized, wholly-septate fragmentary specimen. The umbilicus is relatively narrow, the umbilical wall is low and oblique. The flanks are convex, the venter is highly arched. The whorl-section is elliptical in shape, with maximal thickness near the middle of the flanks. Because of the poor state of preservation, the ribbing cannot be seen, only the traces of the moderately spaced ribs are visible on a portion of the cast. On the wholly septate specimen the suture-lines are not decipherable.

Remarks: Owing to the poor preservation, the identification of the specimen is uncertain. However, the distinctive features of *P. clausiprocerus*, i.e. the dimensions and the shape of the whorl-section, are recognizable. This less common species was figured by SIMIONESCU (1905) and POPOVICI-HATZEG (1905) from Romania (see PATRULIUS 1969, p. 52). According to ARKELL (1951—59, p. 185), from the figures of LISSAJOUS (1923, pl. XI, figs. 1—2) that in pl. XI, fig. 1 is not identical to *P. clausiprocerus*.

Distribution: This species was recorded from both the NW European and Mediterranean regions. At all localities it is restricted to the Zigzag Zone. At Gyenespuszta, similarly the Lower Bathonian Bed 10 of Profile VI has yielded the specimen.

Procerites cf. **hodsoni** ARKELL, 1958

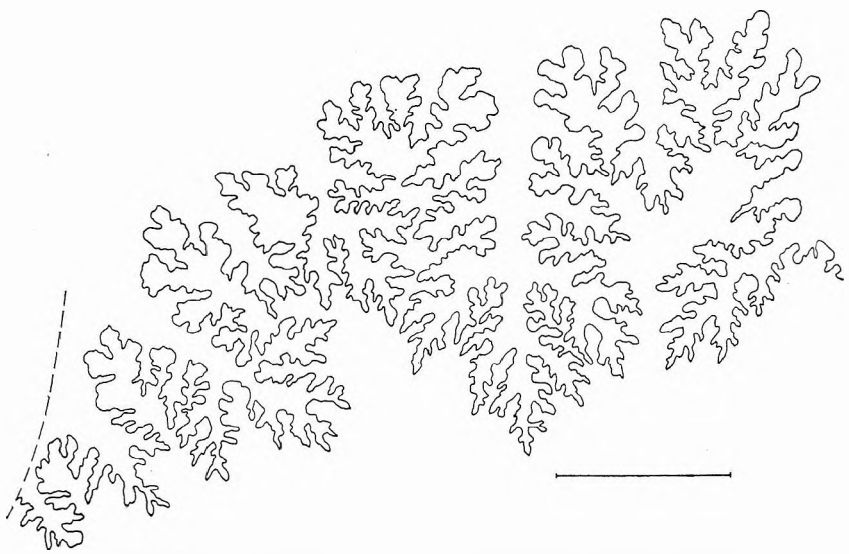
Pl. XXX, Text-fig. 98

1958. *Procerites hodsoni* sp. nov. — ARKELL (1951—59), p. 190. XXV, fig. 1, text-figs. 68—69.
1969. *Procerites hodsoni* ARKELL — HAHN, p. 62, pl. 2, fig. 2, text-figs. 6—7.
?1970a. *Procerites (M. Procerites) hodsoni* ARKELL, 1958 — MANGOLD, p. 30, text-figs. 13—14.
1972. *Procerites hodsoni* ARKELL — KRYSTYN, p. 275, pl. 25, text-fig. 15.

Material: Two poorly preserved internal moulds.
Dimensions: J9427: 230; 83 (40); 50 (22); 81 (39)

Description: The figured specimen is a large ammonite, of subsolved surface. The umbilicus is moderately narrow. The umbilical slope is low, the flanks are convex, the venter is highly arched. The whorl-section is elliptical. The ribbing is hardly visible. On a portion of the penultimate whorl preserved and in some parts of the body-chamber, the low, rounded primary ribs can be traced. These branch into slightly prorsiradiate secondaries at the middle of the flanks. The ribbing tends to fade on the body-chamber, but persists throughout. Septation ceases at about 155 mm, thus the specimen is young, as compared to other, previously figured specimens. The preserved part of the body-chamber occupies the 3/4 of the last whorl.

The elaborate sutures (Text-fig. 98) are of *Procerites* type, perfectly agreeing with those in the holotype (ARKELL 1951—59, pl. XXV, fig. 1c).



Text-fig. 98. Suture-line of *Procerites* cf. *hodsoni* (J9426), VI/1, Retrocostatum Z.

Remarks: *P. hodsoni* differs from other congeneric forms in having persisting ribbing. The elliptically-shaped whorl-section with rounded umbilical and ventrolateral edges is also characteristic. MANGOLD's whorl-section figures (1970a, text-figs. 13—14) show trapezoid whorls, which suggest a probably different form.

On the basis of ribbing, whorl-section and suture-line, the Gyenespuszta specimens are close to the holotype and to the specimens figured from Germany (HAHN 1969) and Austria (KRYSTYN 1972) as well. However, some uncertainty remains, owing to the poor state of preservation.

Distribution: The species has been recorded from both the NW European and Mediterranean province, from the Retrocostatum Zone. The single record from the Lower Bathonian (ELMI et al. 1971, p. 444) probably refers to another species of *Procerites*. At Gyenespuszta the two specimens have come from Bed 1 of Profile VI, i.e. from the Upper Bathonian Retrocostatum Zone.

Genus ZIGZAGICERAS BUCKMAN, 1902

Subgenus ZIGZAGICERAS (PROCEROZIGZAG) ARKELL, 1953

Type species, by original designation (ARKELL 1953, p. 37), *Stephanoceras crassizigzag* BUCKMAN, 1892 (pl. XIV, figs. 2—3). The lectotype was designated by ARKELL (1953).

General remarks: The subgenus *Procerozigzag* comprises medium-sized to large, robust ammonites with *Zigzagiceras*-type ribbing on the inner and middle whorls and *Procerites*-type ribbing on the outer ones.

STURANI (1966) derived *Zigzagiceras* (incl. *Procerozigzag*) from the genus *Bigotites*, through *Zigzagiceras (Franchia)*. On the basis of his well-documented material, this suggestion seems to be well-established and justified. After a short flourishing in the Macrescens Subzone, *Procerozigzag* apparently got extinct without leaving any descendant. On the other hand, it seems to be possible, that some species of the seemingly polyphyletic genus *Procerites*, or even certain *Wagnericeras (Suspensites)* species are descendants of this group. STURANI (loc. cit.) demonstrated, that *Siemiradzkia* originates from *Zigzagiceras* s.s. He found *Siemiradzkia*-type ribbing also on the middle whorls of the subspecies *Z. (P.) postpollubrum garnieri*. This fact suggests, that the macroconch pair of *Siemiradzkia* hitherto traced unsuccessfully should be detected within such a group, which is in evolutional connection with *Z. (Procerozigzag)*.

Distribution: The species of the subgenus *Procerozigzag* occur in the Macrescens Subzone of the Zigzag Zone, but some representatives survive into the Yeovilensis Subzone (see MANGOLD et al. 1967; HAHN 1969). *Procerozigzag*, together with its microconchiate counterpart *Zigzagiceras*, is known mainly from NW European localities. The Gyenespuszta record is one of the first real Mediterranean occurrences ever recorded. ARKELL (1951—59, p. 180; 1956, p. 564) regarded some figures of Mexican Middle Jurassic ammonites of BURCKHARDT (1927) as *Procerozigzag* spp., but recently STURANI (1966, p. 50) pointed out that those are Middle Bajocian stephanoceratids.

Dimorphism: As mentioned earlier by ARKELL (1951—59, p. 165), *Zigzagiceras* and *Procerozigzag* form a morphologically well-established dimorphic pair. The stratigraphic range of the two subgenera is similar.

At Gyenespuszta, besides the two *Procerozigzag* specimens, the Zigzag Zone has yielded a beautifully preserved apertural part of a small ammonite with test. The visible part is the aperture with a short lappet and a small part of the body-chamber, with strong preapertural ventral ribs and some rectiradiate primaries. This small fragment is figured here (Pl. XXIX, fig. 3) as *?Zigzagiceras (?Z.)* sp. indet, because the possibility of *Siemiradzkia* is precluded by the short lappet and the lack of strong preapertural constriction. Nevertheless, all of the previously figured *Zigzagiceras* s.s. specimens attain more or less bigger adult size. This Gyenespuszta specimen, inadequate to any closer specific determination, resembles particularly the figures of *Z. (Z.) euryodos* (SCHMIDT) in ARKELL 1951—59, pl. XXI, figs. 3a-b.

Zigzagiceras (Procerozigzag) pseudoprocerum (BUCKMAN, 1892)

Pl. XXXI, fig. 2, Text-figs. 99, 100

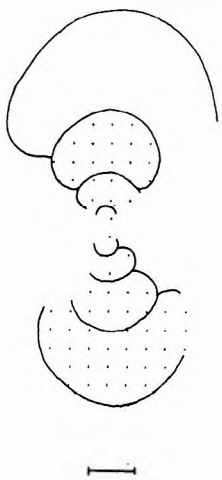
1892. *Stephanoceras pseudoprocerum* nov. — BUCKMAN, p. 450, pl. XIV, figs. 4—5.
1922. *Zigzagiceras rhabdouchus*, nov. — BUCKMAN (1909—30), pls. 300A-B.
1926. *Zigzagiceras pseudoprocerum* S. BUCKMAN — BUCKMAN (1909—30), pl. 623.
1958. *Procerozigzag pseudoprocerum* (S. BUCKMAN) — ARKELL (1951—59), p. 180, pl. XX, figs. 1—4, pl. XXI, fig. 7.

1966. *Zigzagiceras (Procerozigzag) pseudoprocerum* (S. Buckman) — Sturani, p. 50, pl. 19, figs. 1, 4, pl. 22, fig. 2, pl. 23, figs. 2—3.
1970. *Zigzagiceras (Procerozigzag)* sp. aff. *pseudoprocerum* Buckmann — Galácz, p. 120.
non 1971. *Procerozigzag pseudoprocerus* (Buckman 1892) — Krymholz—Zaharov, p. 19, pl. VI, fig. 1, text-fig. 7.
1972. *Zigzagiceras (Procerozigzag) pseudoprocerum* (S. Buckman) — Hahn, p. 10, pl. I, fig. 1.

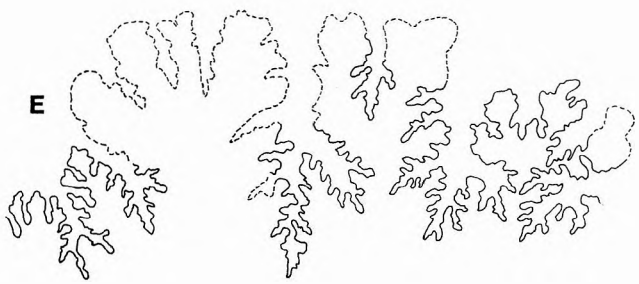
Material: One fragmentary specimen.
Dimensions: J9423: 97; 42 (43); 47 (48.5); 36 (37)

Description: The single specimen available is a fragment of a somewhat subsolved internal cast. The umbilicus is moderately narrow and deep, the umbilical edge is rounded. The flanks are convex, the venter is broadly arched. The whorl-section (Text-fig. 99) is depressed on the inner whorls and semicircular on the body-chamber. The ribbing is hardly visible. The broad primary ribs swing forward and branch into 2 or 3 prorsiradiate, rounded secondaries on the middle of the flanks. The body-chamber begins at about 80 mm diameter, consequently, the specimen is young.

Because of the poor preservation, the suture-line is not distinct. Over the visible parts (Text-fig. 100) it is of *Procerites*-like, with narrow lobes and high, wide saddles.



Text-fig. 99. Whorl-section of *Zigzagiceras (Procerozigzag) pseudoprocerum* (J9423), VI/10, Zigzag Z.



Text-fig. 100. Suture-line of *Zigzagiceras (Procerozigzag) pseudoprocerum* (J9423), VI/10, Zigzag Z.

Remarks: Despite its indistinct ribbing and poorly exposed inner whorls, the Gyenespuszta specimen is undoubtedly a *Z. (P.) pseudoprocerum* specimen, as suggested by its whorl-section, style of ribbing and suture. This is a form well-documented in the literature, thus the identification of even the poor specimens is relatively easier. From the specimens figured under this name, only that of Uzbekistan (Krymholz and Zaharov 1971, pl. VI, fig. 1) seems to be not identical. On the basis of its coarse ribbing and densely ribbed inner whorls it seems to be rather a form from the subgenus *Choffatia (Subgrossouvria)*.

Distribution: In all of the localities of *Z. (P.) pseudoprocerum* this form is restricted to the middle, Morphoceras macrescens Subzone of the Lower Bathonian (see Sturani 1966, p. 13, Elmi et al. 1971, p. 443, Mangold et al. 1967, pp. 109, 110, etc.). The species has been recorded from both the NW European and the Mediterranean regions. At Gyenespuszta, it has come from the middle Zigzag Zone, from Bed 10 of Profile VI.

Zigzagiceras (Procerozigzag) postpollubrum Wetzel, 1937

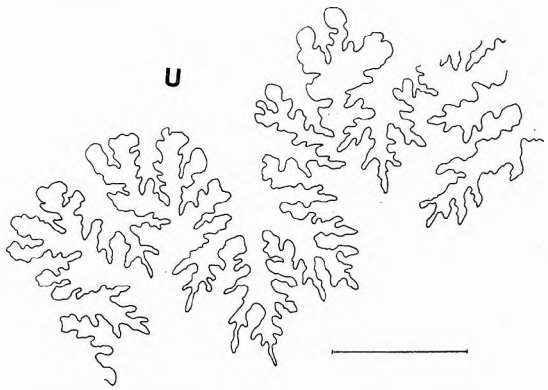
Pl. XXXII, Text-fig. 101

1937. *Zigzagiceras postpollubrum* n. sp. — Wetzel, p. 107, pl. XI, fig. 3.
1966. *Zigzagiceras (Procerozigzag) postpollubrum* Wetzel — Sturani, p. 50, pl. 19, fig. 7, pl. 22, fig. 1, pl. 23, fig. 6.
1970. *Zigzagiceras (P.) postpollubrum* (Wetzel) — Galácz, p. 120.

Material: One specimen of poor preservation.
Dimensions: J9424: 220; 80 (36); ?70 (?32); 71 (32)
200; 75 (37); ?60 (?30); 63 (31.5)

Description: The only specimen available is a large, slightly excentrically coiled, almost entire ammonite. The umbilicus on the inner whorls is narrow, deep, crater-like, from about 150 mm it widens out and becomes shallower. The umbilical wall is high and perpendicular on the inner whorls, but low and oblique on the body-chamber. The umbilical margin is rounded. The whorl-section is rounded-triangular, with flattened, convergent whorl-sides and a narrow and high venter. The visible parts of the specimen are completely smooth, i.e. the ribbing fades out well before the body-chamber. This latter begins at about 175 mm diameter, and is preserved in a two-third whorl. The apertural part is missing.

The suture-line is partly visible (Text-fig. 101), only the *Zigzagiceras*-type, lesser retracted auxiliaries can be seen.



Text-fig. 101. Suture-line of *Zigzagiceras (Procerozigzag) postpollubrum* (J9424), VI/9, Zigzag Z.

Remarks: This species described firstly by Wetzel (1937, p. 107) has been studied in detail by Sturani (1966, p. 50). The Gyenespuszta specimen, with its open umbilicus aud smaller body-chamber width differs somewhat from both the type and the complete specimen of Sturani (loc. cit., pl. 22, figs. 1a-b). On the basis of its wider umbilicus, it is near to the subspecies *Z. (P.) p. garnieri* Sturani, but the earlier fading of the ribs suggests rather the nominate subspecies. On the other hand, the variability of this forms was pointed out by earlier authors (e.g. Mangold et al. 1967, p. 108).

Distribution: The type of this species was described from the Lower Bathonian of NW France. In SE France and Portugal it came from the Macrescens Subzone (Sturani 1966; Elmi et al. 1969). In other localities of France, the species ranges up into the Yeovilensis Subzone, where rather its more involute varieties are common (Gabilly 1964, Mangold et al. 1967). At Gyenespuszta the single specimen came from the upper part of the Zigzag Zone (Bed 9, Profile VI).

Genus WAGNERICERAS Buckman, 1921

Subgenus WAGNERICERAS (WAGNERICERAS) Buckman, 1921

Type species, by original designation (Buckman 1921, in 1909—30, p. 33) *Am. wagneri* Oppel, 1857 (p. 477). The lectotype (= *Am. planula* d'Orbigny 1842—51, p. 416, pl. 144) was formally designated by Arkell (1951—59, p. 176, text-fig. 65).

General remarks: This nominate subgenus of *Wagnericeras* includes medium- to large-sized, massive forms with characteristic "S"-shaped ribs. The coiling is relatively evolute, of broad, oval whorl-section. The suture-line is relatively simple.

The phylogenetic state of *Wagnericeras* is problematic. Arkell (1951—59) regarded this as a polyphyletic group, which originated partly (the evolute forms, *Wagnericeras* s.s.) from some *Procerites*, partly (the subgenus *Suspensites*) from the thick-whorled *Procerites imitator* group. Wetzel (1966, pp. 87—88) suggested that *Wagnericeras* might have descended through unknown transitions, from some parkinsoniids. Sturani (1966) suggested, in turn, that *Bigotites* would be the ancestral form for the evolute, constricted *Wagnericeras* (i.e. *Wagnericeras* s.s.). Hahn (1969, p. 82) originated *Wagnericeras* from *Procerozigzag*, through *P. postpollubrum* as transitional form. Mangold (1970a, text-fig. 160) maintained the possibility of a polyphyletic origin, partly from the *Zigzagiceras*, and partly from the *Procerites* lineages.

Nearly all authors agree that *Wagnericeras* is a polyphyletic morphogenus. The opinion of Hahn (loc. cit.) appears to be most probable as the *Z. (Procerozigzag)* origin explains satisfactorily the presence of strong ribs and parabolic nodes on the inner whorls and the smooth surface and the large size of the outer whorls in this genus.

A common opinion is that *Wagnericeras* gave way to the Callovian *Proplanulites*. It was suggested initially by Siemiradzki (1899), and subsequently by Buckman (1921 in 1909—30, p. 33) and by Spath (1931), etc. Arkell (1951—59) pointed out, that despite the morphological similarity, this connection is uncertain owing to the lack of transitions in the uppermost Bathonian. According to Arkell, the evolute *Wagnericeras* s.s. group was the ancestor of the *Loboplanulites* (= subgenus *Subgrossouvria*). Mangold (1970a, p. 220) came to a similar conclusion, regarding *Wagnericeras* as the ancestral form of *Choffatia*, of some Grossouvriinae and Proplanulitidae.

Accordingly, *Wagnericeras* s.s., arising from *Bigotites*-type ancestors in the basal Middle Bathonian (or perhaps in the Lower Bathonian, see below), is a transition to the *Choffatia (Subgrossouvria)*. In this way, it is distinguished from the subgenus *Suspensites* both morphologically and phylogenetically.

Distribution: *W. banaticum* (KUDERNATSCH, 1852, pl. IV, figs. 1—2) from the condensed Bathonian fauna of Swinitza is considered to be the earliest representative of *Wagnericeras* s.s. This fauna, however, contains both Lower and Upper Bathonian elements (cf. ARKELL 1956, p. 183), thus the Lower Bathonian age of this form is questionable. Stratigraphically controlled *Wagnericeras* s.s. species appear in the basal Middle Bathonian *(W. fortecostatum)*, get enriched in the Subcontractus Zone *(W. fortecostatum, W. pseudosubtile)* and are most common in the Upper Bathonian (*W. bathonicum, W. wagneri*, etc.).

The genus is represented both in the NW European and Mediterranean region, but is unknown in extra-European areas. The *Wagnericeras dietrichi* of COLLIGNON (1958, pl. VII, fig. 27) from Madagascar is an inner whorl with constrictions and dense, radial ribbing, thus the generic identity is uncertain.

Dimorphism: Microconchiate *Wagnericeras* forms have been unknown until recently. According to MANGOLD (1970a, p. 48), there exist microconchiate *Wagnericeras*, which are characterized by small size, the presence of parabolic nodes and simple ribs. Such a *Wagnericeras* microconch (see MANGOLD, loc. cit.) is that described by LISSAJOUS (1923, p. 75, pl. VIII, fig. 3) as *Perisphinctes pelletieri*. The microconchiate nature of such forms needs further evidence, but if it be virtually evidenced, the forms in question—by the style of ribbing—would be the proper match for *Wagnericeras* s.s.

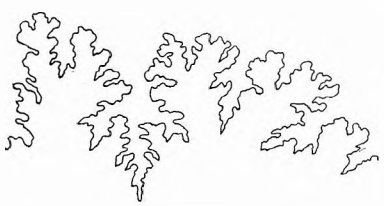
Wagnericeras (Wagnericeras) subfurcula (LISSAJOUS, 1923)

Pl. XXXI, fig. 3, Text-fig. 102

1923. *Perisphinctes* (s. str.) *subfurcula* M. LISSAJOUS — LISSAJOUS, p. 72, text-fig. 14.
1958. *Siemiradzkia (Siemiradzkia) subfurcula* (LISSAJOUS, 1923) — WESTERMANN, p. 81, pl. 40, fig. 1.
1970. *Wagnericeras (W.)* sp. — GALÁCZ, p. 121.
non 1971. *Siemiradzkia subfurcula* (LISSAJOUS, 1923) — KRYMHOLZ—ZAHAROV, p. 24, pl. XII, fig. 1, pl. XIII, fig. 2.

Material: A single, badly-preserved internal mould.
Dimensions: J9428: 64; 25 (39); ?23 (?36); 22 (34)

Description: Medium-sized, widely-umbilicated form with a convex umbilical wall and a rounded umbilical margin. The whorl-sides are convex, the venter is arched. The whorl-section is trapezoidal, with rounded edges. Maximal thickness is measured at the umbilical margin. The ribbing is relatively dense, with strong, somewhat prorsiradiate primaries, which branch into 2 or 3 radial secondaries, at the middle of the flanks. At the beginning of the body-chamber (64 mm diameter) half a whorl shows 16 primary ribs. On the poorly-preserved body-chamber the ribbing seems to tend to be more widely spaced. Apertural part not preserved.



Text-fig. 102. Suture-line of *Wagnericeras (W.) subfurcula* (J9428), VI/7, Subcontractus Z.

The *Wagnericeras*-type suture-line (Text-fig. 102) is simple.

Remarks: Despite the poor state of preservation, the specimen can be easily assigned to the species *W. (W.) subfurcula*. This species is distinguished by its wide umbilicus, trapezoidal whorl-section and dense and straight ribs. A closely allied form is the other species of LISSAJOUS, *Wagnericeras (W.) pseudosubtile*, but it shows a depressed whorl-section and curved secondary ribs. The specimen figured by KRYMHOLZ and ZAHAROV (1971) is a coarsely-ribbed, narrow-umbilicated *Choffatia*.

Distribution: The type was described by LISSAJOUS from the "Zigzagiceras arbustigerum Zone" of Verzé, which roughly corresponds to the Middle Bathonian. The specimen of WESTERMANN from NW Germany came from the Upper Bathonian Aspidoides Zone. The Gyenespuszta specimen occurred in the lower part of the Middle Bathonian Subcontractus Zone (Bed 7 of Profile VI).

Subgenus WAGNERICERAS (SUSPENSITES) Buckman, 1922

Type species, by original designation *Suspensites suspensus* Buckman, 1922 (in 1909—30, pl. 344), for *Am. arbustigerus* Morris and Lycett (1851, pl. II, figs. 4, 4a).

General remarks: The subgenus *Suspensites* comprises the involute, weakly-ribbed *Wagnericeras* spp., with a high whorl-section and convergent whorl-sides. Some species (*W. arbustigerum* group) attain a large size, with complete effacement of ribbing on the body-chamber. In this way, this subgenus differs clearly from *Wagnericeras* s.s., but there are tendencies to unite the two groups (e.g. Mangold 1970a, p. 48).

Arkell (1951—59, p. 235) originated the representatives of the subgenus *Suspensites* from the *Procerites imitator* group, but this latter, broad-whorled *Procerites* occurs in the upper part of the Zigzag Zone, while the earliest *Suspensites*-type *Wagnericeras* appears in the middle of the Zigzag Zone (see *Wagnericeras* n. sp. ind., Sturani 1966, p. 46).

Distribution: After its appearance in the middle part of the Lower Bathonian, *Suspensites* becomes a common element in the Progracilis Zone faunas *(S. suspensum)*, it endures within the Subcontractus Zone *(S. arbustigerum)*, and ranges up into the Aspidoides Zone (*S. arbustigerum*, Torrens 1969a, p. 68). The subgenus is known from NW European and Mediterranean localities, but no records from extra-European areas are available.

Dimorphism: No microconchiate forms for the *Suspensites* subgenus have been mentioned so far.

Wagnericeras (Suspensites) suspensum Buckman, 1922

Pl. XXXIII, fig. 1, Text-fig. 103

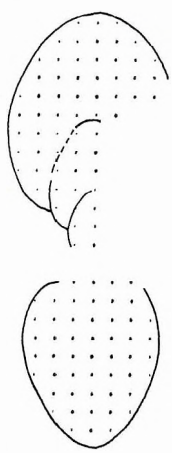
1851. *Ammonites arbustigerus* — Morris—Lycett (1851—55), p. 12, pl. II, fig. 4.
1887. *Ammonites* cf. *arbustigerus* — Quenstedt (1886—87), p. 682, pl. 80, figs. 7—9 (only).
1922. *Suspensites suspensus* nov. — Buckman (1909—30), p. 209, pl. 346.
1958. *Wagnericeras (Suspensites) suspensum* (S. Buckman) — Arkell (1951—59), p. 209, pl. 29, figs. 6—8.
1969. *Wagnericeras suspensum* (S. Buckman) — Hahn, p. 66, pl. I, fig. 2, text-fig. 8a.
1970. *Wagnericeras (S.)* cf. *suspensum* (Buckman) — Galácz, p. 120.
1972. *Wagnericeras suspensum* (Buckman) — Krystyn, p. 280, pl. 19.
1977. *Wagnericeras suspensum* (S. Buckman) — Dietl, p. 38, pl. 6, fig. 2.

Material: Two poorly-preserved internal casts.
Dimensions: J9430: 142; 65 (46); 60 (42); 29 (20.5)
J9429: 111; 51 (46); 52 (47); 25 (22.5)

Description: The original of Pl. XXXIII, fig. 1 is a medium-sized, wholly-septate, narrowly-umbilicated specimen. The umbilical wall is high and convex, the umbilical margin is rounded. The convex whorl-sides are convergent, the venter is highly arched. The whorl-section is triangular, with rounded edges (Text-fig. 103), and with maximal thickness between the umbilical edge and the lower third of the flanks. The ribbing is hardly visible; because of the poor preservation the primaries cannot be seen. The coarse, rounded, rectiradiate secondaries arise at the outer third of the flanks. Both the figured specimen and the other somewhat larger one, are wholly septate. Suture-lines not decipherable, only the strongly retracted auxiliary lobes can be traced.

Remarks: Despite the poor state of preservation, the Gyenespuszta specimens can be well identified with the species *W. (S.) suspensum*, which is distinguished by its triangular whorl-section and proportionally greater whorl-thickness persisting up to larger diameters. The specimen figured by Quenstedt (1886—87, pl. 80, figs. 8—9), should be included in this species, after the revision of Hahn (1969).

Distribution: This species in its type-area in England is one of the characteristic ammonites of the Middle Bathonian Progracilis Zone (Torrens 1967a). The SW German representatives of the species have so far occurred in condensed Bathonian beds (Hahn 1969, p. 69). Similarly condensed Middle and Upper Bathonian strata yielded the Austrian specimen (Krystyn 1972). The records of de Grossouvre (1930, p. 370) and Wetzel (1937, p. 111) refer to the non-divided Bathonian of France. The Gyenespuszta specimen figured here has come from Bed 8 (Progracilis Zone), the other, larger specimen from Bed 6 (Subcontractus Zone) of Profile VI.



Text-fig. 103. Whorl-section of *Wagnericeras (Suspensites) suspensum* (J9430), VI/6, Subcontractus Z.

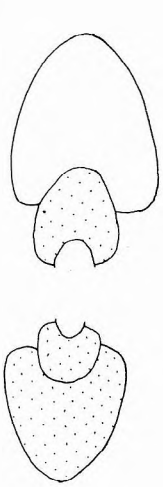
Wagnericeras (Suspensites) sp. aff. arbustigerum (d'Orbigny, 1846)

Pl. XXXIII, fig. 3, Text-figs. 104, 105

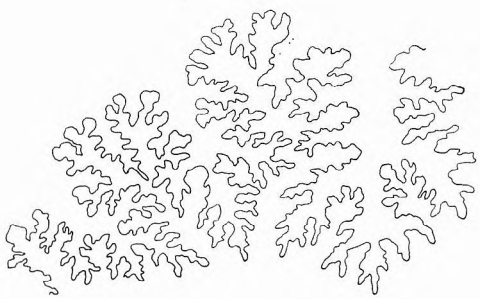
1846. *Ammonites arbustigerus* — d'Orbigny (1842—51), p. 141, pl. 143.
non 1851. *Ammonites arbustigerus* — Morris—Lycett (1851—55), p. 12, pl. II, fig. 4.
non 1887. *Ammonites* cf. *arbustigerus* — Quenstedt (1886—87), p. 689, pl. 80, figs. 7—9.
non 1909. *Perisphinctes arbustigerus* d'Orbigny — Lissajous (1907—12), p. 332, pl. 6, fig. 8.
non 1923. *Perisphinctes (Zigzagiceras) arbustigerum* d'Orbigny — Lissajous, p. 82, pl. XIV, figs. 2—3.
1938. *Perisphinctes procerus* Neum. non Seebach = *arbustigerus* d'Orb. — Passendorfer, p. 170, pl. V, fig. 2.
non 1958. *Wagnericeras* ex gr. *arbustigerum* (d'Orb.) — Westermann, p. 90, pl. 34, fig. 4.
1958. *Wagnericeras (Suspensites) arbustigerum* (d'Orbigny) — Arkell (1951—59), p. 206, text-figs. 76—77.
1966. *Wagnericeras arbustigerum* (d'Orb.) — Wetzel, p. 85, pl. 12, figs. 1—5, pl. 13, figs. 6—7.
1970. *Wagnericeras (Suspensites)* sp. aff. *arbustigerum* (d'Orb.) — Galácz, p. 122.

Material: A single, fragmentary specimen.
Dimensions: J9431: 117; 49 (42); 37 (31.5); 32 (27.5)

Description: A relatively well-preserved, medium-sized internal mould. The umbilicus is deep and narrow, the umbilical wall is high and perpendicular, the umbilical edge is rounded. The whorl-sides are slightly convex, convergent, the venter is low and narrow. The ribbing consists of strong, rounded primary and secondary ribs, which swing forward and fade out at the furcation points. The ribbing dies out gradually on the body-chamber, which begins at 105 mm.



Text-fig. 104. Whorl-section of *Wagnericeras (Suspensites)* sp. aff. *arbustigerum* (J9431), VI/1, Retrocostatum Z.



Text-fig. 105. Suture-line of *Wagnericeras (Suspensites)* sp. aff. *arbustigerum* (J9431), VI/1, Retrocostatum Z.

The suture-line (Text-fig. 105) is elaborate, differs from the other *Wagnericeras* forms, being rather *Procerites*-like. The saddles are wide and tapering, the lobes are narrow, the auxiliaries are retracted.

Remarks: Created by d'Orbigny, this species was misinterpreted in the literature for a long time, what seems to have been mainly due to the bad original figures (see Lissajous 1923, p. 83; Arkell 1951—59, p. 206). The lectotype was designated and figured by Arkell (loc. cit. text-fig. 77) from original specimens of d'Orbigny's collection. Subsequently, Wetzel (1966), relying on inappropriate data, regarded the type material as lost, and, disregarding the previous studies of Arkell, he selected a "neotype" from his own collection. Although his figured specimens seem to be conspecific, this procedure is unacceptable.

From the specimens figured in the earlier literature, the original of pl. II, fig. 4 in Morris and Lycett (1851—55) is the type of *W. (S.) suspensum* Buckman (see above). One of the specimens figured by Quenstedt (1886—87, pl. 80, figs. 8—9) is also *W. (S.) suspensum*, while the other in pl. 80, fig. 7 is probably a Callovian *Kepplerites* (see Deutsche Subkom. f. Jura Strat. 1973). Under the name *Perisphinctes arbustigerus*, Lissajous figured in 1909 and 1923 Lower Bathonian forms, which were later placed into the species *Procerites hodsoni* by Arkell (1951—59, p. 208). From

the two forms figured by WESTERMANN (1958) as a probable *W. arbustigerum*, the larger one seems to be conspecific. The smaller, Lower Bathonian specimen was regarded by STURANI (1966, p. 51) as a form from the *Zigzagiceras (Procerozigzag) postpollubrum* group. If it is the case, the form in question must be a young specimen considering that WESTERMANN mentioned it as a body-chambered form in his plate-explanation.

On the basis of the outer morphology, the Gyenespuszta specimen agrees well with the lectotype of *W. (S.) arbustigerum*. Differences are manifested only in the suture-line. Its elaboration suggests the presence of a transitional form between the mainly Middle Bathonian genus *Wagnericeras* and some representatives of the genus *Procerites* reappearing in the Upper Bathonian.

Distribution: *W. (S.) arbustigerum* has been recorded mainly from the NW European Upper Bathonian. Some Mediterranean occurrences are also known (Switzerland: DOLLFUS 1961, p. 12; Polish Tatras: PASSENDORFER 1938). At Gyenespuszta a specimen came from Bed 1, i.e. from the Retrocostatum Zone of Profile VI.

Subfamilia *Pseudoperisphinctinae* SCHINDEWOLF, 1925

Genus CHOFFATIA SIEMIRADZKI, 1898

Subgenus CHOFFATIA (CHOFFATIA) SIEMIRADZKI, 1898

Type species: *Perisphinctes cobra* WAAGEN, 1875 (in 1873—75, p. 174, pl. XLV, fig. 1). The lectotype was designated by BUCKMAN (1920 in 1909—30, p. 29). For the discussion of the genotype, see ARKELL 1951—59, p. 211.

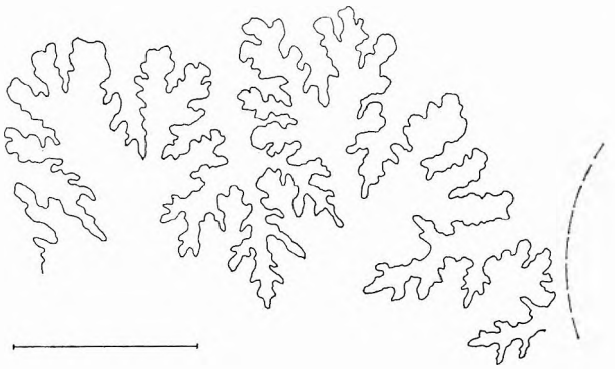
General remarks: The Bathonian *Choffatia* spp. are characterized by lately appearing and distant costation and lately fading seconparies. These forms probably arise from certain finely-ribbed Lower Bathonian *Procerites* (see ARKELL loc. cit., p. 235). HAHN (1969, p. 82) originated *Choffatia* s.l. (excl. *Homoeoplanulites*) again from *Procerites*. According to MANGOLD (1970a, p. 720), the so-called *subbakeriae*-group is different from *Choffatia* s.s., and this former group can be united on the subgeneric level, under the name *Parachoffatia*. This group, subordinated to *Homoeoplanulites* and originated from *Procerites*, was assigned by MANGOLD (loc. cit. p. 218) to the Zigzagiceratinae subfamily. The other, *Choffatia* s.s. auct., group is regarded by MANGOLD as a member of the Grossouvriinae subfamily which was derived, parallel with the subgenus *Subgrossouvria*, from *Wagnericeras* (MANGOLD, loc. cit. p. 220).

It is true, that even at its earliest, Middle Bathonian appearance, *Choffatia* seems to be a morphologically inhomogeneous group, and this fact may suggest a polyphyletic origin, but the similarities in the ribbing and the suture-line contradict the separation into distinct subfamilies.

Distribution: *Choffatia* s.s. appears in the Middle Bathonian. Earliest representative is the *C. arisphinctoides* ARKELL, with a specimen from Fuller's Earth Rock in England (ARKELL 1951—59, pp. 218—219). The genus is especially common in the basal Upper Bathonian, and survives as a richly represented group into the Lower Callovian, lasting up to the Middle Callovian.

Geographically the genus extends over wide Tethyan areas, with several Mediterranean and NW European occurrences.

Dimorphism: Designation of fully corresponding microconchs for the genus *Choffatia* seems to be hitherto unsuccessful. The concept given by MANGOLD (1970a) is apparently influenced by his supposed microconch-macroconch pairing, which shows new elements in several respects. ARKELL (1951—59) and CALLOMON (1963) regarded *Homoeoplanulites* as the microconch counterpart of *Choffatia*. A similar view is expressed by HAHN (1969). MANGOLD (loc. cit.) maintained this opinion, but only for the *Parachoffatia-Homoeoplanulites* pair. On the other hand, as microconchs for the *Choffatia* s.s. he suggested the Bathonian *kontkiewiczi-variabilis* group of the genus *Grossouvria*. However, these newly discovered Bathonian *Grossouvria* species are hardly distinguished from certain small *Homoeoplanulites* and *Siemiradzkia* of the same age, thus the Bathonian *Choffatia* (M)-



Text-fig. 106. Suture-line of *Choffatia (?Homoeoplanulites)* sp. indet. (J9440), VI/4, Subcontractus Z.

Grossouvria (m) paring is unconvincing. It is worthy of note, that these latter, small *Homoeoplanulites*- and *Siemiradzkia*-like forms, which were first figured by DOMINJON (1969), are probably members of a distinct, independent group of upper Middle Bathonian and lower Upper Bathonian age. Those small "*Siemiradzkia*" specimens figured by STEPHANOV (1972, pl. XII) from the basal Upper Bathonian of Bulgaria are most likely members of this group. These forms were assigned to different genera, but rather seem to form a distinct, unnamed genus, the taxonomic position of which needs further detailed studies.

Proper microconchiate counterpart for the *C. subbakeriae* group (*Parachoffatia* sensu MANGOLD), is the *C. (H.) homoeomorpha* group originally suggested. It is justified by recent Middle Bathonian finds [*C. (Homoeoplanulites) buchbergensis* HAHN 1972, p. 14, pl. 2, fig. 4], wich are associated with *Choffatia* of similar age. In addition, Bed 4 of Profile VI of Gyenespuszta here studied has yielded a poorly preserved phragmocone-fragment (No. J9440), which is figured here (Pl. XXXIII, fig. 2, Text-fig. 106) as *Choffatia (?Homoeoplanulites)* sp. indet. This is a portion of an evolute ammonite, with compressed whorl-section and typical *Homoeoplanulites* ribbing, closely resembling the *Homoeoplanulites* figured by LISSAJOUS (1923, pl. X, fig. 4) as "*Perisphinctes* cf. *pseudofrequens*". This record is a further evidence, that typical *Homoeoplanulites*-like *Choffatia* appear as early as the Middle Bathonian, thus the classical *Homoeoplanulites* (m)-*Choffatia* (M) pairing should be regarded as justified stratigraphically, too.

Choffatia (Choffatia) subbakeriae (D'ORBIGNY, 1850)

Pl. XXXIV, fig. 1

	1846.	*Ammonites Bakeriae* SOW. — D'ORBIGNY (1842—51), p. 424, pl. 148 (only).
	1850.	*Ammonites subbakeriae* D'ORB. — D'ORBIGNY (1850—52), p. 296.
	1857.	*Ammonites Moorei* n. sp. — OPPEL (1856—58), p. 178.
non	1892.	*Ammonites subbackeriae* (SOWERBY) — BIZET, p. 108, pl. IX, figs. 4—5.
	?1898.	*Perisphinctes Sub-Backeriae* D'ORB. — SIEMIRADZKI (1898—99), p. 236, text-fig. 47.
non	1905.	*Perisphinctes subbakeriae* (D'ORBIGNY) — BLAKE (1905—1907), p. 49, pl. V, fig. 2.
non	1907.	*Perisphinctes subbakeriae* D'ORBIGNY — LISSAJOUS (1907—12), p. 332, pl. 7, fig. 2.
non	1928.	*Perisphinctes subbakeriae* D'ORBIGNY — SAYN—ROMAN, p. 183, pl. XVI, fig. 6.
non	1932.	*Perisphinctes subbakeriae* D'ORBIGNY sp. — CORROY, p. 135, pl. XIX, figs. 3—6, pl. XX, figs. 7—8, pl. XXI, fig. 7.
	1954.	*Perisphinctes procerus* SEEBACH — ANTONIJEVIČ, p. 95, pl. V, figs. 10—11.
	1959.	*Choffatia subbakeriae* (D'ORBIGNY) — ARKELL (1951—59), p. 215, pl. XXX, fig. 2, pl. XXXII, figs. 1, 8—9, text-figs. 78—79.
	1960.	*Choffatia subbakeriae* (D'ORBIGNY) — RAILEANU—NASTASEANU, p. 19, pl. XI, fig. 39.
	?1963.	*Perisphinctes (Choffatia) subbakeriae* D'ORB. — BATALLER, p. 167, pl. I, fig. 5.
	1969.	*Choffatia (Choffatia) subbakeriae* (D'ORBIGNY) — HAHN, p. 74, pl. 3, fig. 2, pl. 8, fig. 8, text-fig. 10.
	1970a.	*Homoeoplanulites (Parachoffatia) subbakeriae* (D'ORBIGNY) — MANGOLD, p. 73, pl. 3, fig. 1, text-figs. 48—50.
	1970.	*Choffatia (C.) subbakeriae* (D'ORB.) — GALÁCZ, p. 122.
non	1972.	*Choffatia (Choffatia) subbakeriae* (D'ORBIGNY) — KRYSTYN, p. 280, pl. 22, fig. 1, text-figs. 25—26.

Material: Two poorly-preserved internal casts.
Dimensions: J9435: 145; 43 (32); ?44 (?33); 71 (49)

Description: The figure specimend is a large, incomplete internal mould of corroded surface. The umbilicus is wide, the umbilical wall is slightly convex, the umbilical margin is rounded. The whorl-sides are gently convex and somewhat convergent, and meet the venter in rounded ventrolateral edges. The whorl-section is ovally-shaped, with maximal thickness at the lower third of the flanks. The strong, slightly prorsiradiate primary ribs arise on the umbilical margin and branch into 2 or 3 secondaries at the upper third of the whorl-sides. There are 35 primary ribs on the penultimate whorl. The ribbing becomes more widely spaced on the body-chamber beginning at 145 mm diameter, and the secondaries tend to fade. The apertural part of the body-chamber is broken off. Because of the poor state of preservation, the sutures are indistinct.

Remarks: On the basis of dimensions and ribbing, the Gyenespuszta specimens show good agreement with the holotype (figured by ARKELL 1951—59, text-fig. 78). The synonymy of this commonly recorded species was discussed by ARKELL (loc. cit. p. 215) and HAHN (1969, p. 74) in detail. From the recently figured forms that in pl. 22, fig. 1 of KRYSTYN (1972) is different, being a relatively small, narrow-umbilicated complete specimen of *Procerites*-type ribbing.

Distribution: The type came from the Upper Bathonian of Niort (NW France). Lower Callovian occurrences were also recorded. The Gyenespuszta specimens have come from the Upper Bathonian Retrocostatum Zone (Bed 1 of Profile VI).

Choffatia (Choffatia) densidecorata n. sp.

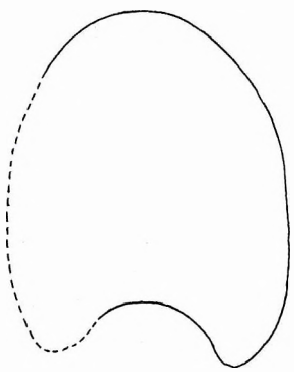
Pl. XXXV, Text-figs. 107, 108

?1923. *Perisphinctes* (s. str.) cf. *pseudofrequens* Siemiradzki — Lissajous, p. 70, pl. X, fig. 4.
1970. *Choffatia (C.)* sp. — Galácz, p. 122.

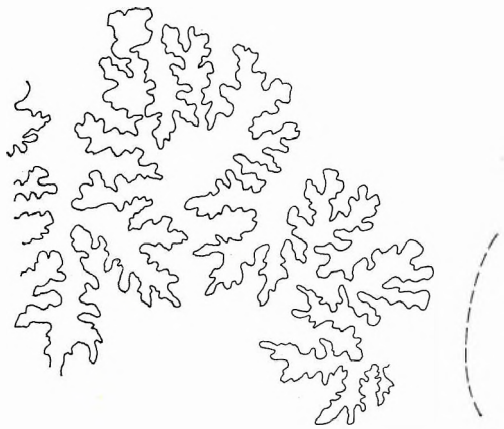
Holotype: Pl. XXXV, J9432.
Locus typicus: Gyenespuszta, Northern Bakony, Transdanubian Central Mts, Profile VI.
Stratum typicum: Bed 1 of Upper Bathonian (Prohecticoceras retrocostatum Zone); ammonitico rosso limestone.
Derivatio nominis: *densidecorata* (Lat.) = densely ornamented; after the dense ribbing of the species.
Diagnosis: *Choffatia* s.s. species with weak, dense primary and secondary ribs and flattened whorl-sides.
Material: Besides the holotype, 2 larger, poorly-preserved specimens.

Dimensions:	J9433: 210;	56 (27);	50 (24);	104 (49)
	J9434: 253;	72 (28.5);	50 (20);	124 (49)
	170;	55 (32);	46 (27);	73 (43)
	Holotype, J9432: 230;	60 (26);	?44 (?19);	115 (50)
	190;	54 (28.5);	?42 (?22);	91 (48)

Description: The holotype is a nearly complete internal mould of a large, evolute ammonite. The umbilicus is wide and shallow, the umbilical wall is low and the umbilical margin is rounded. The whorl-section (Text-fig. 107) is ovally-shaped, with flattened whorl-sides, rounded ventrolateral edges and a low, narrow venter. The ribbing comprises dense, radial ribs. The primaries arise at the umbilical edge and furcate somewhat above the middle of the flanks. On the penultimate whorl the primary ribs are about 47 in number. The ribbing tends to fade on the body-chamber. Secondary ribs fade first, and all ribbing dies out at about the last half of the body-chamber. On another, complete specimen the body-chamber begins at 167 mm and occupies 3/4 of the last whorl.



Text-fig. 107. Whorl-section of *Choffatia (C.) densidecorata* n. sp. (J9434), VI/1, Retrocostatum Z.



Text-fig. 108. Suture-line of *Choffatia (C.) densidecorata* n. sp. (J9434), VI/1, Retrocostatum Z.

This specimen shows the entire aperture, which is simple, with a projected apertural margin. On the penultimate whorl there are two shallow, prorsiradiate constrictions.

Sutures not decipherable on the available specimens, but some portions are visible (Text-fig. 108). These are of *Choffatia*-type, with wide saddles and a moderately retracted auxiliary lobe.

Remarks: This new *Choffatia* species cannot be compared to any form figured previously in the literature. The only, somewhat similar form is that figured by Lissajous (1923), in his pl. X, fig. 4 from Charnay. This is a large, densely-ribbed specimen, but, for lack of knowledge about the shape of the whorl-section, suture-lines and precise stratigraphic position, it might be equally regarded as a *Gracilisphinctes* or a *Choffatia*.

On the basis of its whorl-section and suture-line, this new species must belong to the subgenus *Choffatia (Choffatia)*. Specifically, it is easily distinguished by its dense ribbing.

Distribution: The holotype and the other specimens have come from Bed 1, i.e. from the Upper Bathonian Retrocostatum Zone of Profile VI.

Subgenus CHOFFATIA (SUBGROSSOUVRIA) SPATH, 1924

Type species, by original designation (SPATH 1924), *Perisphinctes aberrans* WAAGEN, 1875 (in 1873—75, pl. XL, fig. 1).

General remarks: The subgenus *Subgrossouvria* is a collective taxon for the ammonites of the so-called "*recuperoi* group". ARKELL (1951—59, p. 212) used the name *Loboplanulites* for this group, in a subgeneric sense, subordinating it to the genus *Choffatia*. *Loboplanulites*, as a genus, was originally erected by BUCKMAN (1925 in 1909—30, pl. 596), with *L. longilobatus* as genotype. ELMI (1962) pointed out, that ARKELL's diagnosis for the subgenus *Loboplanulites* agreed with that for *Subgrossouvria* SPATH, 1924, thus *Loboplanulites* was a synonym of *Subgrossouvria*.

ARKELL (1951—59, p. 235) originated the evolute, strongly ribbed *Choffatia*, corresponding to subgenus *Subgrossouvria*, from *Wagnericeras*. Similarly, a *Wagnericeras* origin was accepted by MANGOLD (1970, p. 220), who regarded this group as appearing in the Middle Bathonian. On the other hand, the probable Lower Bathonian appearance of *C. (S.) uriniacensis* contradicts this origination, because true *Wagnericeras* s.s. arise in the basal Middle Bathonian (see above). STURANI (1966) originated tentatively the evolute, strongly ribbed *Wagnericeras* s.s. from *Bigotites*, mentioning the lack of transitional forms. However, such transitory form would be *Franchia* STURANI, 1966, which shows by its inner whorls relations to *Bigotites*, and at the same time, by its outer whorls, similarities to *Subgrossouvria*. In this way, the subgenus *Subgrossouvria* can be originated by admitting *Bigotites-Franchia-* or *Bigotites-(Franchia?)-Wagnericeras* lineages. To solve this problem needs detailed evaluation of stratigraphically well-controlled and rich perisphinctid faunas.

Distribution: ELMI (1962) gave the stratigraphic range of this subgenus as Upper Bathonian to Upper Callovian. On the other hand, the earliest forms [e.g. *C. (S.) uriniacensis*] seem to appear as early as the Zigzag Zone, and within the Middle Bathonian several representatives were recorded. In the Upper Bathonian the species of the *cerealis* and *recuperoi* groups are common, of which the second survives into the Lower Callovian and is represented by several species.

Subgrossouvria comprises mainly Mediterranean species, with numerous occurrences. NW European records are rarer and refer rather to Callovian forms. At Gyenespuszta this subgenus is represented by earliest appearance in the uppermost bed of the Zigzag Zone and other occurrences up to the Retrocostatum Zone.

Dimorphism: MANGOLD (1970a, p. 158, 222) suggested certain *Grossouvria* species as a microconch pair for the *Subgrossouvria*. He distinguished two groups within this former genus, regarding the *kontkiewiczi-variabilis* group as microconchiate counterparts of *Choffatia* s.s. and *Grossouvria evexa-sulcifera* group as microconchs for *Subgrossouvria*. However, Bathonian microconchiate forms were included only in the former, *kontkiewiczi-variabilis* group, thus the latter match is stratigraphically questionable. According to recent views, *Grossouvria* is restricted to the Callovian, and in fact, the two Bathonian species *(G. bathonica, G. densicostata)* of MANGOLD (loc. cit.) can be assigned rather to that curious group, which was first described by DOMINJON (1969), and subsequently regarded by MANGOLD, as microconch *Homoeoplanulites*.

At the present state of knowledge, no stratigraphically and morphologically appropriate *Subgrossouvria* microconchs can be selected. Because of the polyphyletic origin of the *Choffatia*, it is highly probable, that the proper microconchs, if any, are included in different existing and unnamed genera.

Choffatia (Subgrossouvria) uriniacensis (LISSAJOUS, 1923)

Pl. XXXIV, fig. 3, Text-fig. 109

1923. *Perisphinctes (Grossouvria) uriniacensis* M. LISSAJOUS — LISSAJOUS, p. 69, pl. VII, fig. 3, text-fig. 12.
1970. *Choffatia (Subgrossouvria) uriniacensis* (LISS.) — GALÁCZ, p. 121.

Material: Two incomplete internal moulds.
Dimensions: J9436: 95; 21 (22); 26 (27.5); 52 (55)

Description: Medium-sized, relatively well-preserved internal cast. The umbilicus is extremely wide, the umbilical wall is convex. The umbilical margin is rounded, the flanks are convex, the venter is low, widely-arched. The whorl-section is nearly circular, with maximal thickness somewhat above the lower third of the flanks. The ribbing consists of close, strong, radial primaries on the inner whorls. At about 35 mm diameter the primary ribs suddenly become widely-spaced, and the strong, blunt inner ribs trifurcate in the outer third of the flanks. The style of the secondary ribbing cannot be seen satisfactorily on the specimens, because the ventral parts are worn. The last whorl of the figured specimen of 95 mm diameter bears 26 primary ribs. On the last whorl two deep, wide,

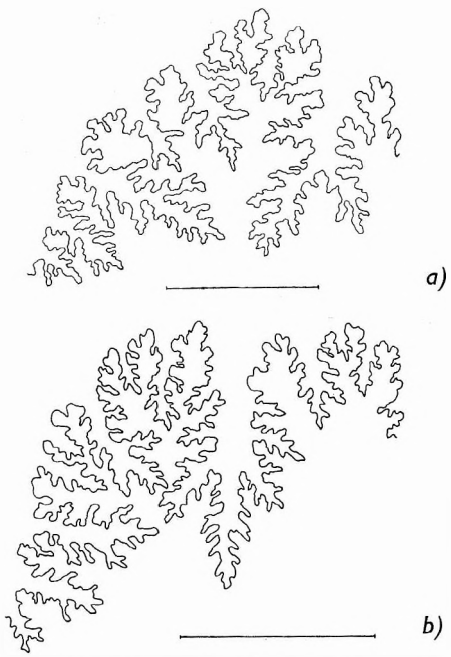
projected constrictions appear. The body-chamber begins at 80 mm diameter; its preserved part comprises the last quarter of the outermost whorl. The apertural part is absent.

The visible part of the complex suture-line (Text-fig. 109) shows only the long, asymmetric, oblique L, the high, tapering, complex LS and the heavily retracted suspensive lobe.

Remarks: This species of LISSAJOUS certainly belongs to the subgenus *Subgrossouvria*, though recently HAHN (1969, pp. 72, 74) declared it a synonym of *Homoeoplanulites acuticosta* (ROEMER). However, it differs by its evolute coiling, coarse ribbing and complex suture-line from the *Homoeoplanulites*.

The holotype (LISSAJOUS 1923, pl. VII, fig. 3) seems to be incomplete, and apparently shows only the inner and middle whorls. The figure is presumably misleading, as the missing outer whorls would have been broken off at a constriction and thus the appearance of the end is similar to an "aperture". The Gyenespuszta specimen is markedly bigger, i.e. its preserved last whorl is septate up to 80 mm diameter.

Distribution: The species *C. (S.) uriniacensis* is undoubtedly the earliest of the *Choffatia* species recorded so far. ARKELL (1954, p. 279; 1956, p. 208) recorded *Choffatia* aff. *uriniacensis* from a Lower Bathonian assemblage of Sicily. This specimen, now in the Sedgwick Museum, Cambridge, is a small, well-preserved ammonite, with 28 primaries and strong constrictions on the last whorl. It certainly belongs to the species. Another record from Sicily is that of WENDT (1964, p. 83), who listed the species together with several Lower Bathonian forms.



Text-fig. 109. Suture-lines of *Choffatia (Subgrossouvria) uriniacensis* (a: J9436, VI/7, Subcontractus Z.; b: J9437, II/3, Subcontractus Z.)

According to ELMI (1967, fig. 85, p. 445), the species in its type-area (Ardèche) appears in the Subcontractus Zone. MANGOLD (1970a, p. 140) dated it as a characteristic of the "Wagnericeras Horizon", i.e. Middle Bathonian.

The Gyenespuszta specimens has come from Bed 7 (Lower Subcontractus Zone) of Profile VI, and from the equivalent bed of Profile II. Accordingly, this mainly Mediterranean species seems to be a good index form in the middle part of the Middle Bathonian.

* * *

Bed 3 of Profile II (lower part of the Subcontractus Zone) yielded a relatively well-preserved *Subgrossouvria* specimen. It is close to *C. (S.) uriniacensis*, but differs by its remarkably larger size (it is septate up to the 105 mm maximal diameter), compressed whorl-section and weakening primaries of the outer whorl. It measures, at 99 mm diameter 29 (29.5); 28 (28.5); 50 (50.5). On the basis of ribbing and whorl-section, it resembles some *Homoeoplanulites* species, but the larger size and the complex suture-line rather suggest a *Subgrossouvria* affinity. It is figured here (Pl. XXXIV, fig. 2) as *Choffatia (Subgrossouvria)* cf. *uriniacensis* (LISSAJOUS).

Choffatia (Subgrossouvria) cerealis ARKELL, 1959

Pl. XXXVI, fig. 1, Text-fig. 110

1905. *Perisphinctes* sp. l. — BLAKE (1905—1907), p. 52, pl. V, fig. 4.
1958. *Choffatia (Choffatia)* sp. a. — WESTERMANN, p. 84, pl. 41, pl. 43, fig. 3.
1959. *Choffatia (Loboplanulites) cerealis* sp. nov. — ARKELL (1951—59), p. 219, pl. XXXI, figs. 4—6, text-figs. 79—80.
1969. *Choffatia (Choffatia) cerealis* ARKELL — HAHN, p. 76, pl. 3, fig. 3, text-fig. 10.
1970a. *Choffatia (M. Subgrossouvria) cerealis* (ARKELL) 1959 — MANGOLD, p. 159, pl. 3, fig. 9, text-figs. 115—116.
1970. *Choffatia (Subgrossouvria) cerealis* ARKELL — GALÁCZ, p. 121.

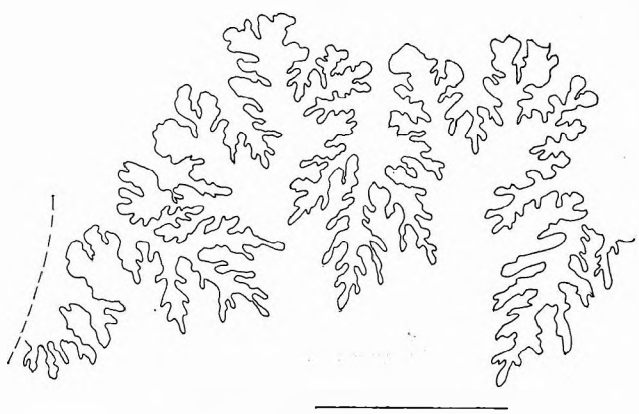
Material: A single, fragmentary internal mould.
Dimensions: J9438: 144; 40 (38); 46 (32); 72 (50)

Description: A large, evolute ammonite, with a steep umbilical wall, and a rounded umbilical margin. The convex whorl-sides gradually round into the highly-arched venter. The whorl-

section is oval, with maximal thickness near the inner third of the flanks. The ribbing on the inner whorls is characterized by coarse and close primaries. At about 60 mm diameter the primary ribs gradually become widely-spaced. The primaries trifurcate in the outer third of the flanks, where intercalatories also arise. The last chambered whorl bears 24 primary ribs. There are 3 prorsiradiate, deep constrictions on each whorl. The preserved body-chamber occupies two-thirds of the last whorl, but the trace of the continuing umbilical seam shows at least a further half-of-a-whorl part of body-chamber.

The suture-line (Text-fig. 110) is complex, with a broad E, a trifid and slightly asymmetric L and a strongly retracted suspensive lobe. The first lateral saddle is broadly-stemmed, the second lateral is slender, but spreading adorally.

Remarks: *C. (S.) cerealis* is a transitory form between the involute and evolute species of the subgenus *Subgrossouvria*. The involute group is represented by *C. (S.) longilobata* (BUCKMAN), and similar forms figured by KRYMHOLZ and ZAHAROV (1971, pl. VI, fig. 1, pl. XII, fig. 1, pl. XIII, fig. 2) from the Middle Bathonian of Kugitan (Uzbekistan). The evolute group comprises the sensu stricto "*recuperoi* group", which appears with several species in the Middle and Upper Bathonian (see below).



Text-fig. 110. Suture-line of *Choffatia (Subgrossouvria) cerealis* (J9438), II/1, Retrocostatum Z.

On the basis of its dimensions and ribbing, the Gyenespuszta specimen agrees with well the holotype (ARKELL 1951—59, pl. XXXI, figs. 4a-b), but its primaries become distant slightly later. This character, however, as judged by the figures of ARKELL and subsequent authors, seems to be a little variable.

Distribution: The holotype came from the Lower Cornbrash (Discus Zone), Dorset, Southern England, but English specimens are also known from the Retrocostatum Zone (TORRENS 1969a, p. 68). ARKELL (1951—59, pp. 219, 240) mentioned Middle Bathonian occurrences too, but, according to TORRENS (1969a, and pers. comm.), this species is known in England exclusively from the Upper Bathonian.

The Gyenespuszta specimen, the first representative of this species ever recorded from Mediterranean localities, has been yielded by Bed 1 of Profile II (= Retrocostatum Zone).

* * *

From the Middle Bathonian portion (Beds 9, 8, 7, 4) of Profile II came some badly preserved *Subgrossouvria* specimens, which proved unidentifiable specifically. The specimen figured here (Pl. XXXVI, fig. 2) from Bed 4 measures 109; 27 (25); 26 (24); 60 (55). The largest specimen, again from Bed 4, is of 177 mm diameter, and is septate up to 130 mm. Its preserved body-chamber part occupies 3/4 of the last whorl. The specimens are extremely evolute serpenticones, of circular whorl-section. The ribbing is typically *Subgrossouvria*-like, the somewhat irregular, dense primaries of the inner whorls gradually change into widely-spaced, coarse, triplicate ribs on the outer whorls. There are deep and wide constrictions. Sutures are not clearly visible.

These specimens undoubtedly belong to a distinct species, which is close to the *Subgrossouvria rakotondramazavai* of COLLIGNON (1958, pl. XI, fig. 60) from the "Upper Bathonian" of Madagascar. Under the name *Choffatia rakotondramazavai* (COLLIGNON) KRYSTYN figured *Subgrossouvria* specimens (1972, pl. 20, fig. 1, pl. 21, fig. 1, text-fig. 25), which, however, differ from both the Madagascar and the Gyenespuszta specimens, because their regular primary ribs become coarse and distant earlier and suddenly at a deep constriction at about 40 mm diameter.

On the basis of the poorly-preserved material of Gyenespuszta, these specimens are referred to here as *Choffatia (Subgrossouvria)* sp. aff. *rakotondramazavai* COLLIGNON.

REFERENCES

AGER D. V. and CALLOMON J. H. 1971: On the Liassic age of the "Bathonian" of Villány (Baranya). — Ann. Univ. Sci. Budapest, Sec. Geol., t. XIV. (1970), pp. 5—16.

ALLENBACH P. 1966: Geologie und Petrographie des Damvand und seiner Umgebung (Zentral-Elburz), Iran. — Mitt. Geol. Inst. E. T. H. Univ. Zürich, N. F. 63, pp. 1—145.

AMMANIAZOV K. 1972: (North Asian parkinsoniids.) (In Russian.) — Ashabad, pp. 1—34, pls. I—XI.

ANDELKOVIČ M. and JAVIDPOUR M. 1966: Biostratigraphy of the Bathonian Stage in the area between the villages of Senokos and Kamenica (Stara Planina). — Ann. Géol. Péninsule Balkanique, t. XXXII, pp. 1—5.

ANTONIJEVIČ I. 1954: Der Dogger von Zgrelo (Ost-Serbien). — Bull. Serv. Géol. Géophys. Serbie, Vol. XI, t. X, pp. 89—101, pls. I—VIII.

ARKELL W. J. 1940: The ammonite succession at the Woodham Brick Company's pit, Akemian Str. Station, Buckinghamshire, and its bearing on the classification of the Oxford Clay. — Quart. J. Geol. Soc. London, Vol. XCV. (1939), Part. 2, pp. 135—222, pls. VIII—XI.

ARKELL W. J. 1950: A classification of the Jurassic ammonites. — J. Paleont., Vol. XXIV, No. 3, pp. 354—364.

ARKELL W. J. 1951: A Middle Bathonian ammonite fauna from Schwandorf, Northern Bavaria. — Mém. Suiss. Pal., Vol. 69, No. 1, pp. 1—18, pls. 1—3.

ARKELL W. J. 1951—59: A monograph of the English Bathonian Ammonites. — Paleont. Soc., Vols. CIV—CXII, pp. 1—VIII, 1—264, pls. I—XXXIII.

ARKELL W. J. 1952: Jurassic ammonites from Jebel Tuwaiq, central Arabia. — Philos. Trans. Roy. Soc., Ser. B, Vol. 236, No. 633, pp. 241—313, pls. XV—XXXI.

ARKELL W. J. 1953: Seven new genera of Jurassic ammonites. — Geol. Mag., Vol. 90, No. 1, pp. 36—40.

ARKELL W. J. 1954: The ammonite faunas. In: WARMAN H. R. and ARKELL W. J.: A review of the Jurassic of western Sicily based on new ammonite faunas. — Quart. J. Geol. Soc., Vol. CX, No. 439, pp. 276—281.

ARKELL W. J. 1956: Jurassic Geology of the World. — Oliver and Boyd, Edinburgh, pp. 1—806.

ARKELL W. J., KUMMEL B. and WRIGHT C. W. 1957: Mesozoic Ammonoidea. In: MOORE R. C. (Ed.): Treatise on Invertebrate Palaeontology, Part L. Cephalopoda, Ammonoidea. — Geol. Soc. Amer., Univ. Kansas Press. pp. L80—L465.

ARKELL W. J. and LUCAS G. 1953: Découverté récente du genre Ermoceras Douvillé dans l'Atlas saharien occidental. — C. R. Acad. Sci. Paris, Vol. CCXXXVI, pp. 2257—2259.

ASSERETO R., BARNARD P. D. W. and FANTINI SESTINI N. 1968: Jurassic stratigraphy of the Central Elburz (Iran). — Riv. Ital. Paleont., Vol. 74, No. 1, pp. 3—21.

AZARIAN N. R. 1963: (Stratigraphy and fauna of the Jurassic deposits in the Alaverd district of the Armenian Republic.) (In Russian.) — Akad. Nauk Arm. S. S. R. Yerevan, pp. 1—225, pls. I—XIII.

BARBULESCU A. 1974: Stratigrafia jurasicului din vestul Dobrogei Centrale. (In Rumanian, with French abstract.) — Acad. R. S. R. Bucuresti, pp. 1—265, pls. I—IL.

BARFÉTY J. C., DEBELMAS J. and MOUTERDE R. 1972: Caractères stratigraphiques, paléontologiques et structuraux du Jurassique inférieur et moyen des bordures W et SE du massif de Belledone (Isére). — Géol. Alpine, t. 48, fasc. 1, pp. 61—86, pls. I—II.

BATALLER J. R. 1922: El jurásico de la provincia de Terragona. — Trab. Mus. Nac. Ci. Nat., Ser. Geol., No. 29, pp. 5—117, pls. VII—VIII.

BATALLER J. R. 1963: El Calloviense de Abejuela (Teruel). Notas y Commus. — Inst. Geol. Min. España, No. 69, pp. 131—174, pls. I—IV.

BAUGIER A. and SAUZÉ M. 1843: Notice sur quelques coquilles de la famille des Ammonidées, recueilles dans le terrain jurassique des Deux-Sévres. — Mém. Soc. Statistique Niort, pp. 127—140, pls. I—IV.

BAYLE M. 1878: Fossiles principaux des terrains. — Expl. Carte Géol. France, t. IV, pls. I—CLVIII.

BAYLE E. 1879: Liste recificative de quelques noms de genres de coquilles. — J. Conchyliol., Vol. XXVII, pp. 34—35.

BENTZ A. 1924: Die Garantianenschichten von Norddeutschland mit besonderer Berücksichtung des Brauneisenoolithorizontes von Harzburg. — Jb. Preuss. Geol. Landesanst., XLV, pp. 119—193, pls. 4—9.

BENTZ A. 1928: Über Strenoceraten und Garantianen insbesondere aus dem mittleren Dogger von Bielefeld. — Jb. Preuss. Geol. Landesanst., XLIX, pp. 138—206, pls. 14—19.

BESNOSSOW N. V. 1956: (New and less-known Jurassic Lytoceratina.) (In Russian.) — Bull. Soc. Nat. Moscow, Sec. Geol., Vol. 4, p. 109.

Besnossow N. V. 1957: (New data to the morphology and systematics of Phylloceratáceae.) (In Russian.) — Bull. MOIL, t. XXXII, 2, p. 166.

Besnossow N. V. 1858a: (Jurassic ammonites of the northern Caucasus and the Crimea. Phylloceratina and Lytoceratina.) (In Russian.) — Leningrad, pp. 1—118, pls. I—XXXIV.

Besnossow N. V. 1958b: (Data on the systematics of the families Lytoceratidae Neumayr and Nannolytoceratidae Spath.) (In Russian.) — Vest. Mosk. Univ., Ser. Biol., Pochvov. Geol., Geogr., Vol. 1, p. 109.

Bigot M. 1904: Catalogue critique de la collection Defrance, conservée au Musée d'histoire naturelle de Caen. Deuxième partie, Cephalopodes, Arthropodes et vers. — Bull. Soc. Linn. Norm., Sér. 5, Vol. 8. (1905), pp. 251—273.

Bigot A. 1934: Les récifs bathoniens de Normandie. — Bull. Soc. Géol. France, Sér. 5, t. IV, pp. 697—736, pls. XXXIV—XLII.

Bircher W. 1935: Studien in Oberen Bajocien der Ostschweiz (Glarker und St. Galleralpen). — Safarowski Ed., Cairo, pp. 1—179, pls. 1—12.

Bizet P. 1892: Note sur les limites du terrain Calloviens dans le Nord-Ouest de la France. — Bull. Soc. Géol. Norm., t. XIV. (1890), pp. 79—119, pls. VIII—XIII.

Blake J. F. 1905—1907: A monograph of the fauna of the Cornbrash. — Palaeontogr. Soc. pp. 1—102, pls. I—IX.

Boehm G. 1912: Die Südküsten der Sula-Inseln Taliabu und Mangoli. 4. Abschn.: Unteres Callovien. In: Beiträge zur Geologie von Niederländisch-Indien, 1. Abt. — Palaeontographica, Suppl. 4, Abt. 1, pp. 121—179, pls. XXXII—XLIV.

Bonarelli G. 1894: Hecticoceras novum genus Ammonidarum. — Bull. Soc. Malac. Ital., Vol. XVIII, pp. 73—108.

Borissiak J. 1908: Die Fauna des Donetz-Jura. I.: Cephalopoda. — Mem. Com. Geol., N. S., livr. 37, pp. 1—94, pls. 1—10.

Böckh J. 1881: (Data to the knowledge on the Jurassic deposits of the Mecsek Mountains and adjacent area. II. Part. Palaeont.) (In Hungarian.) — Ért. Term.-tud. Köréből, Budapest, Vol. XI, No. IX, pp. 1—107, pls. I—X.

Brasil L. 1895: Céphalopodes nouveaux ou peu connus des étages jurassiques de Normandie. — Bull. Soc. Géol. Norm., t. XVI. (1892—93), pp. 27—46, pls. I—IV.

Bremer H. 1966: Ammoniten aus dem unteren Bajocium und unteren Bathonium in der Umgebung von Ankara (Türkei). — N. Jb. Geol. Paläont. Abh., Bd. 125, pp. 155—168, pls. 15—18.

Buckman S. S. 1881: A descriptive catalogue of some of the species of ammonites from the Inferior Oolite of Dorset. — Quart. J. Geol. Soc., Vol. XXXVII, pp. 588—608.

Buckman S. S. 1883: Some new species of ammonites from the Inferior Oolite. — Proc. Dorset Nat. Hist. Archaeol. Soc., 4, pp. 137—146, pls. 1—4.

Buckman S. S. 1887—1907: A monograph on the Inferior Oolite ammonites of the British Islands. — Palaeontogr. Soc., 246 and 456 p., pls. I—CXXVII.

Buckman S. S. 1892: The morphology of "Stephanoceras" zigzag. — Quart. J. Geol. Soc., Vol. XLVIII, pp. 447—452, pls. XIII—XIV.

Buckman S. S. 1905: On certain genera and species of Lytoceratidae. — Quart. J. Geol. Soc., Vol. LXI, p. 142.

Buckman S. S. 1909—1930: (Yorkshire) Type ammonites. — Vols. 1—7. London, pls. 1—790.

Buckman S. S. and Secretary 1908: Illustrations of type specimens of Inferior Oolite ammonites in the Sowerby collection. — Palaeontogr. Soc., Vol. LXII.

Burckhardt C. 1927: Cefalopodos del Jurasico medio de Oaxaca y Geurrero. — Bol. Inst. Geol. Mexico, No. 47, pp. 1—108, pls. 1—XXXIV.

Callomon J. H. 1963: Sexual dimorphism in Jurassic ammonites. — Trans. Leic. Lit. Phil. Soc., Vol. LVII, pp. 21—56.

Callomon J. H. 1969: Dimorphism in Jurassic ammonites. Some reflections. In: Westermann G. E. G. (Ed.): Sexual dimorphism in fossil metazoa and taxonomic implications, an IPUCE Symposium. — IUGS, Ser. A, No. 1, pp. 111—121.

Cariou E. 1967: Les zones d'ammonites dans le Callovien du Centre-Est de la France. In: Cariou E., Elmi S., Mangold C., Thierry J. and Tintant H.: La succession des faunes dans le Callovien français. Essais de corrélation à l'échelle de la zone. — Coll. Jurassique, Luxembourg 1967. Mém. B. R. G. M. Fr., No. 75. (1971), pp. 666—671.

Cariou E. 1973: Ammonites of the Callovian and Oxfordian. In: Hallam A. (Ed.): Atlas of Palaeobiogeography. — Elsevier, Amsterdam. pp. 287—295.

Cariou E., Elmi S., Mangold C., Thierry J. and Tintant H. 1967: La succession des faunas dans le Callovien français. Essais de corrélation à l'échelle de la zone. — Coll. Jurassique, Luxembourg 1967. Mém. B. R. G. M. Fr., No. 75. (1971), pp. 665—692.

Chikhachev P. 1933: (Ammonitidae from the Callovian beds of the northern Caucasus.) (In Russian.) — Trans. United Geol. Prosp. Serv. USSR, fasc. 104, pp. 3—42, pls. I—IV.

Christ H. A. 1960: Beiträge zur Stratigraphie und Paläontologie des Malm von Westsizilien. — Schweiz. Palaeont. Abh., Vol. 77, fasc. 3, pp. 1—141, pls. 1—9.

Ciry R. and Tintant H. 1966: Observations sur le Bathonien de la vallée de la Seine. — Bull. Carte Géol. France, No. 278, t. LXI, pp. 75—91, pls. 1—3.

Cobban W. A. 1969: The Late Cretaceous ammonites Scaphites leei Reeside and Scaphites hippocrepis (DeKay) in the Western Interior of the United States. — Geol. Surv. Prof. Paper, No. 619, pp. 1—27, pls. 1—5.

Collignon M. 1958: Atlas des fossiles caracteristiques de Madagascar (Bathonien, Callovien). — Serv. Géol. Madagascar, fasc. 2, pls. 6—33.

Corroy G. 1932: Le Callovien de la bordure orientale du Bassin de Paris. — Mém. Carte Géol. Dét. France, pp. 1—337, pls. 1—29.

Couffon O. 1917—1919: Le Callovien du Chalet, commune de Montreuil-Bellay (Maine-et-Loire). — Bull. Soc. Études Sci. Angers, Vols. XLVII—XLIX, pp. 1—245, pls. 1—18.

Del Campana D. 1905: Fossili del Giuria superiore dei Sette Comuni in provincia di Vicenza. — Pubbl. R. Ist. Studi Sup. Firenze, Sez. Sci. Fiz. Nat., No. 28, pp. 1—140, pls. I—VII.

Deutsche Subkomission für Jura-Stratigraphie 1973: F. A. Quenstedt: Die Ammoniten des Schwäbischen Jura. Revision der Gattungsnamen und Untergattungsnamen. — Schweizerbart. Verl., Stuttgart, pp. 1—50.

Dieni I., Massari F. and Sturani C. 1966: Segnelazione di ammoniti nel Giurese della Sardegna orientale. — Acc. Naz. Lincei, Rend. Cl. Sc. Fis., Mat., Nat., Ser. 8, Vol. 40, fasc. 1, pp. 99—107.

Dietl G. 1973: Middle Jurassic (Dogger) heteromorph ammonites. In: Hallam A. (Ed.): Atlas of Palaeobiogeography. — Elsevier, Amsterdam, pp. 283—285.

Dietl G. 1974: Zur Stratigraphie und Ammonitenfauna des Dogger, insbesondere des Oberbajocium der westlichen Keltiberischen Ketten (Spanien). — Stuttgarter Beitr. Naturk., Ser. B, Nr. 14, pp. 1—21, pls. 1—3.

Dietl G. 1975: Die entrollten Ammoniten des Schwäbischen Juras. — Stuttgarter Beitr. Naturk., Ser. C, Nr. 4, pp. 36—43.

Dietl G. 1977: The Braunjura (Brown Jurassic) in Southerst Germany. — Stuttgarter Beitr. Naturk., Ser. B, Nr. 25, pp. 1—41, pls. 1—7.

Djanélidzé A. 1933: Matériaux pour la géologie du Radcha. — Bull. Inst. Géol. Géorgie, Vol. I, fasc. 1, pp. 1—80, pls. I—X.

Dollfus S. 1961: Über das Alter des Blegi-Ooliths in der Glärnisch-Gruppe. — Mitt. Naturf. Ges. Kantons Galrus 11. pp. 91—108, pls. I—II.

Dominjon P. 1969: Essais de paléontologie bugiste. II. Homoeoplanulites du Bugey. — Le Bugey, fasc. 56, pp. 1—23, pls. I—III.

Donovan D. T. and Hölder H. 1958: On the existence of heteromorph ammonoids in the Lias. — N. Jb. Geol. Paläont., Mh. 5, pp. 217—220.

Dorn P. 1927: Die Ammonitenfauna der Parkinsonienschichten bei Thalmässig (Frankenalb). — Jb. Preuss. Geol. Landesanst., XLVIII, pp. 225—251, pls. IV—VII.

Douvillé H. 1879: (Communication without title.) — Bull. Soc. Géol. France, Sér. 3, t. VII, C. R., p. 91.

Douvillé H. 1880: Note sur l'Ammonites pseudo-anceps et sur la forme de son ouverture. — Bull. Soc. Géol. France, Sér. 3, t. VIII, pp. 239—246.

Douvillé H. 1884: Sur quelques fossiles de la zone à Ammonites Sowerbyi des environs de Toulon. — Bull. Soc. Géol. France, Sér. 3, t. XIII, pp. 12—44, pls. I—III.

Douvillé H. 1916: Les terrains secondaires dans le Massif du Moghara à l'est de l'Isthime de Suez. — Paléontologie, Mém. Acad. Sci. Paris, 2, Vol. LIV, pp. 1—184, pls. I—XXI.

Douvillé R. 1909: In: Palaeontologia Universalis, Sér. II, fasc. 4, Nos. 133—134.

Douvillé R. 1915: Études sur les Cosmocératidés des collections de l'École Nat. Sup. des Mines et de quelques autres collections publiques ou privées. — Mém. Serv. Explic. Carte Géol. Dét. France, pp. 1—75, pls. I—XXIV.

Elmi S. 1962: Considerations sur Choffatia (Subgrossouvria) (Ammonitina, Pseudoperisphinctinae). — C. R. Somm. Séan. Soc. Géol. France, No. 7, pp. 205—206.

Elmi S. 1967: Le Lias supérieur et le Jurassique moyen de l'Ardéche. — Doc. Lab. Géol. Fac. Sci. Lyon, No. 19, fasc. 1—3, pp. 1—845, pls. 1—17.

Elmi S. 1971: Les faunes à Prohecticoceras (Oppeliidae, Ammonitina) du Bathonien inférieur et moyen des confins Algero-Marocains. — Geobios, No. 4, fasc. 4, pp. 243—267, pls. 19—20.

Elmi S., Mangold C., Mouterde R. and Ruget C. 1971: Révision de l'étage Bathonien au Cap Mondego (Portugal). — Coll. Jurassique Medit. Budapest, 1969. Ann. Inst. Geol. Publ. Hung., Vol. LIV, fasc. 2, pp. 439—450.

Enay R. 1959: Note sur quelques Tulitidées (Ammonitina) du Bathonien. — Bull. Soc. Géol. France, Sér. 7, t. I, pp. 252—259, pl. VIIb.

Entschewa M. 1959: Paleofaunistische Forschungen des Juras aus der Gegend von Trojan und Tetewen (In Bulgarian with German abstract). — Ann. Dir. Géner. Rech. Géol., Sér. A, Vol. IX. (1958), pp. 87—124, pls. I—IX.

Fallot P. and Blanchet F. 1923: Observations sur la faune des terrains jurassiques de la région de Cardó et de Tortosa (Provincie de Terragonne). — Treb. Inst. Catalana Hist. Nat., Vol. 1921—22, fasc. II, pp. 73—264, pls. 1—13.

Fantini Sestini N. 1973: Revisione del genere "Audaxlytoceras" Fucini, 1923 (Ammonoidea). — Riv. Ital. Paleont., Vol. 79, No. 4, pp. 479—502.

Favre E. 1876: Description des fossiles du terrain jurassique de la Montagne des Voirons (Savoie). — Mém. Soc. Paléont. Suisse, Vol. II, pp. 1—79, pls. I—VII.

Favre E. 1912: Contribution à l'étude des Oppelia du Jurassique moyen. — Mém. Soc. Paléont. Suisse, Vol. XXXVIII, pp. 1—33, pl. I.

Flamand G. B. M. 1911: Recherches géol. et géogr. sur le Haut-Pays de l'Oranie et sur le Sahara (Algérie et Territoires du Sud). — Lyon, pp. 1—1001, pls. 1—16.

Floridia G. 1931: Osservazioni geologiche sul M. Inici (Trapani). — Bol. Soc. Geol. Ital., Vol. 50, pp. 87—112, pls. III—VI.

Frebold H. and Tipper H. W. 1975: Upper Callovian and Lower Oxfordian ammonites from southeastern Bowser Basin, British Columbia. — Can. J. Eart Sci., Vol. 12, No. 2, pp. 145—157, pls. I—II.

Fucini A. 1920—1935: Fossili Domeriani dei Dintorni di Taormina. — Palaeontogr. Ital., t. XXVI—XXXV, 169 p., 35 pl.

Fürsich F. T., Sykes R. M. 1977: Palaeobiogeography of the European Boreal Realm during Oxfordian (Upper Jurassic) times: a quantitative approach. — N. Jb. Geol. Paläont. Abh., 155, 2, pp. 137—161.

GABILLY J. 1964: Le Jurassique inférieur et moyen sur le littoral Vendéen. — Trav. Inst. Géol., Anthrop., Préhist., Fac. Sci. Poitiers, t. V, pp. 65—107.

GALÁCZ A. 1968: (Geological and paleontological studies on the Middle Jurassic of Gyenespuszta.) (In Hungarian.) — University Thesis, Budapest. (Manuscript.)

GALÁCZ A. 1970: Biostratigraphic investigation of the Middle Jurassic of Gyenespuszta, Northern Bakony, Transdanubian Central Mountains, Hungary. — Ann. Univ. Sci. Budapest. Sec. Geol., t. XIII, pp. 109—128.

GALÁCZ A. 1971: (Biostratigraphic investigations on the Middle Jurassic of Gyenespuszta, Northern Bakony.) (In Hungarian.) — PhD Thesis, Budapest. (Manuscript.)

GALÁCZ A. 1976: Bajocian (Middle Jurassic) sections from the Northern Bakony (Hungary). — Ann. Univ. Sci. Budapest. Sec. Geol., t. XVIII, pp. 177—191.

GARDET G. and GÉRARD C. 1946: Contribution à l'étude pal. du Moyen Atlas septentrional: Lias inférieur — Bathonien. — Notes Mém. Serv. Géol. Maroc, No. 64, pp. 1—88, pls. I—VIII.

GÉCZY B. 1967: Ammonoides jurassiques de Csernye, Montagne Bakony, Hongrie. Part II. (excl. Hammatoceratidae). — Geol. Hung., Ser. Palaeont., fasc. 35, pp. 1—413, pls. I—XLV.

GÉCZY B. 1971a: L'âge du banc à Ammonites de Villány. — Coll. Jurassique Medit. Budapest, 1969. Ann. Inst. Geol. Publ. Hung., Vol. LIV, fasc. 2, pp. 465—469.

GÉCZY B. 1971b: Examen quantitatif des Ammonoides liasiques de la Montagne Bakony. — Coll. Jurassique Medit. Budapest 1969. Ann. Inst. Geol. Publ. Hung., Vol. LIV, fasc. 2, pp. 483—486.

GILLET S. 1937: Les ammonites du Bajocien d'Alsace et de Lorraine. — Mém. Serv. Carte Géol. Alsace et Lorraine, 5, pp. 1—130, pls. 1—5.

GEMMELLARO G. G. 1872: Sopra i Cefalopodi della zona con Stephanoceras macrocephalum. — Atti Acad. Gioenia, Ser. 3, t. VIII. (1873), pp. 165—202, pls. I—V.

GEMMELLARO G. G. 1877: Sopra alcuni fossili della zona con Posidonomya alpina Gras. — Giorn. Sci. Nat. Econ. Palermo, t. XII, pp. 51—81, pls. III—IVbis.

GLANGEUD P. 1897: Sur le forme de l'ouverture de quelques ammonites. — Bull. Soc. Géol. France, Sér. 3, t. XXV, pp. 99—106, pl. III.

GOTTSCHE C. 1878: Über jurassische Versteinerungen aus der argentinischen Cordillere. — Palaeontographica, Suppl. III, Lief. 2, Abt. 3, pp. 1—50, pls. I—VIII.

GROSSOUVRE M. A. DE 1888: Études sur l'étages Bathonien. — Bull. Soc. Géol. France, Sér. 3, t. XVI, pp. 366—401, pls. III—IV.

GROSSOUVRE M. A. DE 1891: Sur le Callovien de l'ouest de la France et sur sa faune. — Bull. Soc. Géol. France, Sér. 3, t. XIX, pp. 247—262, pl. IX.

GROSSOUVRE M. A. DE 1907: Sur la variabilité de l'espèce chez les ammonites. — Six. Congr. Assoc. Franc-Comt., Véspul.

GROSSOUVRE M. A. DE 1919: Bajocien-Bathonien dans la Niévre. — Bull. Soc. Géol. France, Sér. 4, t. XVIII, pp. 337—459, pls. XIII—XVI.

GROSSOUVRE M. A. DE 1930: Notes sur le Bathonien moyen. — Livr. Jub. Cent. Soc. Géol. France, t. II, pp. 361—387, pls. XXXIX—XL.

HAHN W. 1968: Die Oppeliidae Bonarelli und Haploceratidae Zittel (Ammonoidea) des Bathoniums (Brauner Jura Epsilon) im südwestdeutschen Jura. — Jh. Geol. Landesamt Baden-Württemberg, 10, pp. 7—72, pls. 1—5.

HAHN W. 1969: Die Perisphinctidae Steinmann (Ammonoidea) des Bathoniums (Brauner Jura Epsilon) im südwestdeutschen Jura. — Jh. Geol. Landesamt Baden-Württemberg, 11, pp. 29—86, pls. 1—9.

HAHN W. 1970: Die Parkinsoniidae S. Buckman und Morphoceratidae Hyatt (Ammonoidea) des Bathoniums (Brauner Jura Epsilon) im südwestdeutschen Jura. — Jh. Geol. Landesamt Baden-Württemberg, 12, pp. 7—62, pls. 1—8.

HAHN W. 1971: Die Tulitidae S. Buckman, Sphaeroceratidae S. Buckman und Clydoniceratidae S. Buckman (Ammonoidea) des Bathoniums (Brauner Jura Epsilon) im südwestdeutschen Jura. — Jh. Geol. Landesamt Baden-Württemberg, 13, pp. 55—122, pls. 1—9.

HAHN W. 1972: Neue Ammonitenfunde aus dem Bathonium (Brauner Jura Epsilon) der Schwäbischen Alb. — Jh. Geol. Landesamt Baden-Württemberg, 14, pp. 7—16, pls. 1—2.

HALLAM A. 1975: Jurassic environments. — Cambridge Univ. Press, Cambridge, pp. 1—269.

HAUER F. R. 1854: Beiträge zur Kenntnis der Heterophyllen der österr. Alpen. — Sitzungsb. Akad. Wiss. Wien, Bd. XII, pp. 861—910, pls. I—IV.

HAUER F. R. 1857: Palaeont. Not. No. 4. Eine neue Ammoniten-Art aus dem Klaus-Schichten. — Sitzungsb. Akad. Wiss. Wien, Bd. XXIV, pp. 156—158, pls. I—II.

HAUG E. 1890: Note sur le péristome du Phylloceras mediterraneum. — Bull. Soc. Géol. France, Sér. 3, t. XVIII, pp. 328—333, pl. IV.

HIMSHIASHVILI N. G. 1957: (Upper Jurassic fauna of Georgia. Cephalopods and lamellibranchs.) (In Russian.) — Publ. Acad. Sci. Georgia, Trans. Inst. Paleobiol., pp. 1—309, pls. I—XXXI.

HIMSHIASHVILI N. G. 1961: (Relationships of the Upper Jurassic mollusc faunas of Georgia to those of the northern Caucasus.) (In Russian.) — Publ. Acad. Sci. Georgia, Trans. Inst. Paleobiol., pp. 1—211, pls. I—XIII.

HORWITZ L. 1936—1937: La faune et l'âge des couches à Posidonomyes (Zones Piénine des Klippen, Carpates Polonaises). — Bull. Serv. Géol. Pol., A, pt. 8, 4; B pt. 9, 1.

IMLAY R. W. 1961: New genera and subgenera of Jurassic (Bajocian) ammonites from Alaska. — J. Paleont., Vol. 35, No. 3, pp. 467—474, pls. 63—64.

IMLAY R. W. 1962: Jurassic (Bathonian or early Callovian) ammonites from Alaska and Montana. — US Geol. Surv. Prof. Pap., 374. C, pp. 1—32, pls. 1—8.

IMLAY R. W. 1964: Middle Bajocian ammonites from the Cook Inlet Region, Alaska. — US Geol. Surv. Prof. Pap., 418. B, pp. 1—61, pls. 1—29.

Imlay R. W. 1967: Twin Creek Limestone (Jurassic) in the Eastern Interior of the United States. — US Geol. Surv. Prof. Pap., 540, pp. 1—105, pls. 1—16.

Imlay R. W. 1970: Some Jurassic ammonites from central Saudi Arabia. — US Geol. Surv. Prof. Pap., 643. D, pp. 1—15, pls. 1—4.

Imlay R. W. 1973: Middle Jurassic (Bajocian) ammonites from Eastern Oregon. — US Geol. Surv. Prof. Pap., 756, pp. 1—100.

Jaworski E. 1926: La fauna del Lias y Dogger de la Cordillera Argentina en la parte meridional de la Provincia de Mendoza. — Actas Acad. Nac. Cienc., Vol. IX, Nos. 3—4, pp. 138—319, pls. I—IV.

Jeannet A. 1951: Stratigraphie und Palaeontologie des oolitischen Eisenerzlagers von Herznach und seiner Umgebung. — Beitr. Geol. Schweiz, Bd. 5, Lief. XIII, pp. 1—240, pls. 1—107.

Joly B. 1976: Les Phylloceratidae malgaches au Jurassique. Generalités sur les Phylloceratidae et quelques Juraphyllitidae. — Doc. Lab. Géol. Fac. Sci. Lyon, No. 67, pp. 1—471, pls. 1—9; 1—61.

Jullien G. 1911: Étude sur les Phylloceras jurassique et crétacé. — C. R. Somm. Soc. Géol. France, Vol. XI, pp. 129—130, pl. I.

Jüssen E. 1890: Beiträge zur Kenntnis der Kalusschichten in den Nordalpen. — Jb. k.-k. Geol. Reichsanst., Bd. 40, H. 2, pp. 381—398, pl. II.

Kakhadze J. R. 1937: Les ammonites bajociennes de la Géorgie occidentale. — Bull. Inst. Géol. Géorgie, 2, 2. (1936), pp. 123—198, pls. I—VIII.

Kakhadze J. R. and Zesashvili V. I. 1955: (A new Middle Jurassic ammonite genus Kubanoceras gen. nov.) (In Russian.) — Soob. Akad. Nauk Gruz. S. S. R., t. XVI, No. 6.

Kakhadze J. R. and Zesashvili V. I. 1956: (Bajocian fauna from the valleys of the Kuban and its some affluents.) (In Russian.) — Trudy Geol. Inst. Akad. Nauk Georg. S. S. R., Ser. Geol., t. IX. (XIV), 2, pp. 5—55, pls. I—VIII.

Kaszap A. 1959: Doggerschichten im Villányer Gebirge (Südungarn). (In Hungarian, with German abstract.) — Földt. Közl., 89, 3, pp. 262—269, pls. VIII—XVI.

Kennedy W. J. and Cobban W. A. 1976: Aspects of ammonites biology, biostratigraphy and biogeography. — Spec. Pap. Palaeont., 17, pp. 1—94, pls. 1—11.

Konda J. 1970: Litologische und Fazies-Untersuchung der Jura-Ablagerungen des Bakony-Gebirges. — Ann. Inst. Geol. Publ. Hung., Vol. L, fasc. 2, pp. 227—260.

Kopik J. 1974: Genus Cadomites Munier-Chalmas, 1892 (Ammonitina) in the Upper Bajocian and Bathonian of the Cracow-Wielun Jurassic range and the Góry Swietokrzyskie Mountains (Southern Poland). — Inst. Geol., Biul., 276. (1974), t. VII, pp. 7—53, pls. I—XI.

Krymholz G. J. 1961: (Ammonites of the Lower and Middle Jurassic deposits of the northern Caucasus.) (In Russian.) — Leningrad Univ. Press, pp. 1—166, pls. I—IX.

Krymholz G. J. 1962: Sur la subdivision du Jurassique marin adoptée en URSS. — Coll. Jurassique Luxembourg 1962, C. R. Mém., pp. 747—761.

Krymholz G. J. and Zaharov E. F. 1971: (Bathonian ammonites of Kugitan.) (In Russian.) — Nyedra, Leningrad, pp. 1—27, pls. I—XIII.

Krystyn L. 1972: Die Oberbajocium- und Bathonium-Ammoniten der Klaus-Schichten des Steinbruches Neumühle bei Wien (Österreich).— Ann. Naturhist. Mus. Wien, 76, pp. 195—310, pls. 1—24.

Ksiażkiewicz M. 1956: The Jurassic and Cretaceous of Bachowice. (In Polish, with English abstract.) — Rocz. Polski. Tow. Geol., t. XIV, fasc. 2—3, (1954), pp. 117—405.

Kudernatsch J. 1852: Die Ammoniten von Swinitza. — Abh. k.-k. Geol. Reichsanst., 1, 2, pp. 1—16, pls. 1—4.

Kuhn O. 1939: Die Ammoniten des fränkischen Callovium. — Nova Acta Leop., N. F., Bd. 6, Nr. 44, pp. 448—532, pls. 48—57.

Kunz B. W. L. 1967: Eine Fauna aus dem oberen Dogger der niederösterreichischen Kalkvoralpen. — Ann. Naturhist. Mus. Wien, 71, (Kühn-Festschrift.), pp. 263—293, pls. 1—3.

Kutuzova V. V. 1975: (Bajocian parkinsoniids from Tuarkyr and Mangyslak.) (In Russian.) In: Besnossow N. V. (Ed.): (New data on the stratigraphy of the Mesozoic sequences of the oil-gas regions in the southern USSR.) (In Russian.) — Trudy VNIGRI, Moscow, Vol. 171, pp. 82—88, pls. XV—XXV.

Lanquine A. 1929: Le Lias et le Jurassique des Chaines Provencales. I. Le Lias et le Jurassique inférieur. — Bull. Carte Géol. France, t. XXII, No. 173, pp. 1—385, pls. I—XII.

Lee G. 1905: Contribution à l'étude stratigraphique et paléontologique de la Chine de la Faucille. — Mém. Soc. Paléont. Suisse, Vol. XXXII, pp. 1—91, pls. I—III.

Lehmann U. 1976: Ammoniten: ihr Leben und ihre Umwelt. — F. Enke Verlag, Stuttgart, pp. 1—171.

Lemoine P. 1910—1911: Ammonites du Jurassique supérieur du Cercle d'Analalava (Madagascar). — Ann. Paléont., t. V—VI, pp. 1—52, pls. I—VIII.

Lissajous M. 1907—1912: Jurassique Máconnais: fossiles caractéristiques et les plus répandus. — Bull. Soc. Hist. Nat. Mácon, t. III, Nos. 3—16.

Lissajous M. 1923: Étude sur la faune du Bathonien des environs de Mácon. — Trav. Lab. Géol. Univ. Lyon, Mém. 3, pp. 1—286, pls. I—XXXIII.

Lóczy L. jun. 1915: Monographie der Villányer Callovien-Ammoniten. — Geol. Hung., t. I, fasc. 3—4, pp. 1—253, pls. I—XIV.

Loriol P. 1900: Étude sur les mollusques et brachiopodes d'Oxfordien inférieur ou zone à Ammonites renggeri du Jura Lédonien. — Mém. Soc. Paléont. Suisse, Vol. XXVII, pp. 1—196, pls. I—VI.

Makowski H. 1963: Problem of sexual dimorphism in ammonites. — Palaeont. Pol., No. 12, pp. 1—92.

Mangold C. 1970a: Les Perisphinctidae (Ammonitina) du Jura Méridional au Bathonien et au Callovien. — Doc. Lab. Géol. Fac. Sci. Lyon, No. 41, fasc. 2, pp. 1—246, pls. 1—16.

MANGOLD C. 1970b: Morphoceratidae (Ammonitina-Perisphinctaceae) Bathoniens du Jura Méridional, de la Niévre et du Portugal. — Geobios, No. 3, fasc. 1, pp. 43—130, pls. 3—7.

MANGOLD C., ELMI S. and GABILLY J. 1967: Les faunes du Bathonien dans la moitié sud de la France. Essai de zonation et correlations. — Coll. Jurassique Luxembourg 1967, Mém. B. R. G. M. Fr., No. 75. (1971), pp. 103—132.

MANGOLD C., ENAY R. and DOMINJON P. 1964: Note préliminaire sur le Bathonien inférieur du Bugey (Jura méridional). — Bull. Soc. Géol. France, Sér. 7, Vol. 6, pp. 529—534.

MARCHAND D. and THIERRY J. 1974: Les infuences mésogéennes et boréales dans le Callovien de Bourgogne. — Bull. Soc. Géol. France, Sér. 7, t. XVI, No. 4, pp. 476—489.

MASCKE E. 1907: Die Stephanoceras-Verwandten in den Coronaten-Schichten von Norddeutschland. — Inaug. Dissert. Univ. Göttingen, pp. 1—38.

MAUBEUGE P. L. 1950: Sur le Bathonien et en particulier sur la Bathonien lorrain. — Private edition, Nancy. pp. 1—16.

MAUBEUGE P. L. 1951: Les ammonites du Bajocien de la région frontière franco-belge. — Mém. Inst. Roy. Sci. Nat. Belgique, 2, fasc. 42, pp. 1—104, pls. I—XVI.

MAUBEUGE P. L. 1955: Les ammonites aaléniennes, bajociennes et bathoniennes du Jura suisse septentrional. — Mém. Suiss. Pal., 71, pp. 1—48, pls. 1—11.

MAUBEUGE P. L. 1961: Catalogue des ammonites du Jurassique inférieur et moyen (Hettangien à Bathonien) du Musée cantonal de Bâle-Campagne. — Tätigk. Nat. Ges. Baselland, 22. (1958—1960), pp. 1—164.

MAUBEUGE P. L. 1975: Catalogue des ammonites du Jurassique supérieur (Callovien à Kimmeridgien) du Musée cantonal de Bâle-Campagne. 4éme partie. — Tätigk. Nat. Ges. Baselland, 29, (1971—1974), pp. 40—338.

MAXIM I., DRAGOS I. and CLICHIC O. 1971: Nouvelles formes d'ammonoidées du Dogger de Svinita-Svinecea Mare (Banat). (In Rumanian, with French abstract.) — Stud. Cerc. Geol., Geof., Geogr., Ser. Geol., t. 16, No. 2, pp. 405—477, pls. I—XXIII.

MENEGHINI J. 1867: Monographie des fossiles du Calcaire Rouge Ammonitique (Lias supérieur) de Lombardie et de l'Appenin Central. In: STOPPANI A. (Ed.): Paléontologie Lombarde etc. — Sér. 4, Milano, pp. 1—242, pls. I—XXXI.

MIHAILOVIČ M. 1954: Description stratigraphique et paléontologique de quelques espéces d'ammonites des couches de Klaus de Greben (Serbie orientale). — Ann. Géol. Pénins. Balkanique, 21, pp. 123—134, pls. I—III.

MIHAILOVIČ M. 1969: Klauska ammonitska fauna dogera okoline Donjeg Milanova (istr. Srbija). — Bull. Mus. Hist. Nat. Belgr., Sér. A, 24, pp. 45—125, pls. I—XVII.

MORRIS J. 1845: Description of some species of the genus Ancyloceras. — Ann. Mag. Nat. Hist., Vol. 15, pp. 31—34, pl. 6.

MORRIS J. and LYCETT J. 1851—1855: A monograph of the Mollusca from the Great Oolite, Chiefly from Minchinhampton and the Coast of Yorkshire. — Palaeontogr. Soc., pp. 1—130, 1—147, pls. I—XV; I—XV.

MORTON N. 1971: Some Bajocian ammonites from western Scotland. — Palaeontology, Vol. 14, 2, pp. 266—293, pls. 40—51.

MORTON N. 1975: Bajocian Sonniniidae and other ammonites from western Scotland. — Palaeontology, Vol. 18, 1, pp. 41—91, pls. 6—17.

MOUTERDE R., ENAY R., CARIOU E., CONTINI D., ELMI S., GABILLY J., MANGOLD C., MATTEI J., RIOULT M. and TINTANT H. 1971: Les zones du Jurassique en France. — C. R. Somm. Soc. Géol. France 1971, fasc. 6, pp. 1—27.

MUNIER-CHALMAS E. C. P. A. 1892: Sur la possibilité d'admettre un dimorphisme sexual chez les Ammonitidés. — C. R. Soc. Géol. France, Sér. 3, t. XX, pp. CLXX—CLXXIV.

NAGY I. Z. 1963: Ammonites déroulés (Spiroceratidae) dans les couches Jurassiques de la Montagne Mecsek. — Rélations Ann. Inst. Geol. Hung. (1960), pp. 197—201, pl. I.

NEGRI L. 1936: Revisione dell'ammoniti liassiche della Lombardia occidentale. — Parte II. Palaeontogr. Ital., Vol. XXXVI, pp. 1—57, pls. I—IV.

NEUMAYR M. 1870: Die Klippe von Czetechowitz in Mähren. — Jb. k. k. Geol. Reichsanst., Bd. XX, H. IV, pp. 549—558, pl. XXIII.

NEUMAYR M. 1871: Jurastudien 3. Die Phylloceraten des Dogger und Malm. — Jb. k. k. Geol. Reichsanst., Bd. XXI, H. III, pp. 297—354, pls. XII—XVII.

NEUMAYR M. 1875: Die Ammoniten der Kreide und die Systematik der Ammonitiden. — Zeitschr. Deutsch. Geol. Ges., Bd. 27. pp. 854—892.

NEUMAYR M. and UHLIG V. 1892: Über die von H. Abich im Kaukasus gesammelten Jurafossilien. — Denkschr. k. k. Akad. Wiss. Math. Nat. Cl., 59, pp. 1—122, pls. 1—6.

NICOLESCO C. P. 1916: Sur un nouveau genre de Périsphinctidés (Bigotella) de l'Oolithe ferrugineuse de Bayeux (Calvados). — Bull. Soc. Géol. France, Sér. 4, t. XVI, pp. 153—179, pl. IV.

NICOLESCO C. P. 1918: Rectification de nomenclature. — C. R. Somm. Soc. Géol. France, Nos. 1—2, p. 36.

NICOLESCO C. P. 1927—1928: Étude monographique du genre Parkinsonia. — Mém. Soc. Géol. France, N. Sér. 5, No. 9, pp. 1—84, pls. 1—16.

NICOLESCO C. P. 1931: Étude monographique du genre Bigotites. — Mém. Soc. Géol. France, N. Sér. 17, pp. 1—52, pls. 1—8.

NIKANOROVA L. A. 1972: (Stratigraphy and some ammonite species in Middle Jurassic of Central Caucasus.) (In Russian.) — Bull. Moskow Soc. Nat. Geol., Ser., Vol. XLVII, 2. pp. 58—69, pls. I—III.

NOETLING F. 1896: Fauna of the Kellaways of Mazar Dirk. — Palaeont. Indica, Ser. 16, Vol. I, pt. I. (1897), pp. 1—22, pls. 1—3.

NOSZKY J. JUN. 1943: Bericht über geologische Untersuchungen im Innengebiet des nördlichen Bakonygebirges. — Jber. k. Ung. Geol. Anst. (1939—40), Bd. I, pp. 253—161.

Noszky J. jun. 1957: Geologische Karte des Nordteiles des Bakony-Gebirges im Maßstab 1:25 000. — Jb. Ung. Geol. Anst., Vol. XLVI, 3. (1950—1954).

Noszky J. jun. 1961: Formation jurassiques de la Hongrie. — Ann. Inst. Geol. Hung., Vol. XLIX, 2, pp. 481—501.

Ochoterena H. F. 1966: Amonitas del Jurasico Medio de Mexico. II.: Infrapatoceras gen. nov. — Univ. Nal. Autón. Mexico Inst. Geol., Paleont. Mexico, No. 23, pp. 1—18, pls. 1—3.

Oppel A. 1856—1858: Die Juraformation Englands, Frankreichs und des südwestlichen Deutschlands. — Württ. Naturwiss. Jahresh., XII—XIV, pp. 1—857.

Oppel A. 1862—1863: Über jurassische Cephalopoden. — Palaeont. Mitt. Mus. k. Bayer. Staates, I, H. 2—3, pp. 127—288, pls. XL—LXXXII.

d'Orbigny A. 1842—1851: Paléontologie Francaise, Terrain Jurassique. I. Céphalopodes. — Paris. pp. 1—642, pls. 1—234.

d'Orbigny A. 1850—1852: Prodrôme de paléontologie stratigraphique universelle des animaux mollusques et rayonnes. — Paris.

Paitschadze T. A. 1973: (The stratigraphy and fauna of the Upper Jurassic sequence of southern Osetia.) (In Russian.) — Akad. Nauk. Gruz. S. S. R., Geol. Inst., Trudy, N. S. 41, pp. 1—98, pls. I—XXXV.

Parona C. F. 1894: La fauna fossile (Calloviana) di Acque Fedde sulla sponda veronese del Lago di Garda. — Mem. Acad. Lincei, Ser. 4, 7, pp. 365—395, pl. I.

Parona C. F. 1896: Nouve osservationi sopra la fauna e l'età degli strati con Posidonomya alpina nei Sette Comuni. — Palaeont. Ital., 1, pp. 1—42, pls. I—II.

Parona C. F. and Bonarelli G. 1897: Sur le faune de Callovien inférieur (Chanasien) de Savoie. — Mém. Acad. Sci. Savoie, Sér. 4, Vol. VI, pp. 35—211, pls. I—XI.

Parsons C. F. 1974: The Bajocian stratigraphy of eastern England. — Proc. Yorksh. Geol. Soc., Vol. 40, pt. 1, No. 7, pp. 115—118.

Parsons C. F. 1975: Ammonites from the Doulting Conglomerate Bed (Upper Bajocian, Jurassic) of Somerset. — Palaeontology, Vol. 18, 1, pp. 191—205, pl. 36.

Parsons C. F. 1976: A stratigraphic revision of the Humphriesianum and Subfurcatum Zone rocks (Bajocian Stage, Middle Jurassic) of southern England. — Newsl. Stratigr., Vol. 5, No. 2—3, pp. 114—142.

Passendorfer E. 1935: Studien über die Stratigraphie und die Paläontologie des hochtatrischen Jura in Tatry. Teil I. — Ann. Soc. Géol. Pol., 11, pp. 83—103, pls. II—IV.

Passendorfer E. 1938: Étude sur la stratigraphie et la paléontologie du Jurassique haut-tatrique dans les Tatras. Partie II. — Trav. Inst. Géol. Univ. Wilno, N. S. 4, pp. 1—9, pls. I—III.

Patrulius D. 1969: La géologie du Massif des Bucegi et du Couloir de Dimbovicioara. — Acad. Rep. Soc. Romania, Bucuresti.

Pavia G. 1969: Nouvelles données sur le Bajocien de Digne (Basses-Alpes). Coéxistence de Normannites, Itinsaites, Stemmatoceras, Teloceras avec les prémiers représentatis de la superfamille Persiphinctaceae à la base de la zone à Subfurcatum. — Boll. Soc. Geol. Ital., 88, pp. 445—451, figs. 1—4.

Pavia G. 1972: Ammoniti del Bajociano superiore di Digne (Francia SE, dip. Basses-Alpes). — Bol. Soc. Paleont. Ital., Vol. 10, No. 2. (1971), pp. 75—142, pls. 14—29.

Pavia G. and Sturani C. 1968: Étude biostratigraphique du Bajocien des Chaines Subalpines aux environs de Digne (Basses-Alpes) (Note préliminaire). — Boll. Soc. Geol. Ital., 87, pp. 305—316.

Petitclerc P. 1915: Essai sur la faune du Callovien dans le départment des Deux-Sévres et, plus spécialement, de celle des environs de Niort. — Contr. Étude Terr. Jur., Vésoul, 162 p, 14 pls.

Pompeckj J. F. 1893: Beiträge zu einer Revision der Ammoniten des Schwäbischen Jura. Lief. I. Phylloceras, Psiloceras, Schlotheimia. — Schweitzerbart, Stuttgart, pp. 1—94, pls. 1—7.

Popovici-Hatzeg V. 1905: Les céphalopodes du Jurassique du Mont Strunga (Massif de Bucegi, Roumanie). — Mém. Soc. Géol. France (Paléont.), 13, No. 35, pp. 1—28, pls. IX—XIV.

Potonié R. 1929: Die ammonitischen Nebenformen des Dogger (Apsorroceras, Spiroceras, Parapatoceras). — Jb. Preuss. Geol. Landesanst., 50, pp. 216—261, pls. XVII—XIX.

Preda I. 1963: Studiul geologic al regiunii Rosita-Meziad (Muntii Padurea Craiului). — Ed. Acad. Rep. Pop. Rom., pp. 1—103, pls. I—XVI.

Prinz Gy. 1904: Fauna der älteren Jurabildungen im nordöstlichen Bakony. — Mitt. Jb. Ung. Geol. Anst., 15, pp. 1—42, pls. I—XXXVIII.

Pugin L. 1964: Étude critique des Lytoceratina du Dogger. — Mém. Suiss. Pal., Vol. 80, pp. 1—67, pls. 1—3.

Pusch G. G. 1837: Polens Paläontologie . . . etc. — Schweitzerbart, Stuttgart.

Quenstedt F. A. 1845—1849: Petrefactenkunde Deutschlands. 1. Die Cephalopoden. — Tübingen. pp. 1—580, pls. I—XXXVI.

Quenstedt F. A. 1858: Der Jura. — Tübingen. pp. 1—842, pls. 1—100.

Quenstedt F. A. 1886—1887: Die Ammoniten des schwäbischen Jura. — Stuttgart, pp. 1—1140, pls. 1—126.

Raileanu G. and Nastaseanu S. 1960: Contributii la Cunoastrea Callovianului din zona Resita. — Stud. Cerc. Geol., Geof., Geogr., Ser. Geol., t. 9, No. 2.

Raileanu G.—Pelin M. 1960: Fauna calcarelor oolitice feruinoase din zona Svinita-Svinecea Mare (Banat). — Anal. Univ. "C. I. Parhon", Ser. Geol.-Geogr., IX, 23.

Rakus M. 1962: Die Ammonitenfauna aus den roten knolligen Kalken der Manin-Serie. — Geol. Prace, Zprávy 24, pp. 143—151, pls. XI—XII.

Rakus M. 1965: Zur Biostratigraphie der Jura-Schichten in der Kostelec-Klippe. — Geol. Prace, Zprávy 37, B pp. 163—177.

Ramaccioni G. 1939: Fauna giuraliassica e cretacea del Monte Cucco e dintorni (Appennino Centrale). — Palaeont. Ital., Vol. XXXIX, (N. S. IX), pp. 143—213, pls. X—XIV.

Redlich K. A. 1894: Der Jura der Umgebung von Alt-Achtala. — Beitr. Paläont. Geol. Österr.—Ung., Orient, Vol. IX, pp. 1—55.

Renz C. 1909: Étude stratigraphique et paléontologique sur le Lias et le Trias en Gréce. — Bull. Soc. Géol. France, Sér. 4, t. IX, pp. 249—636, pls. IX—XI.

Renz C. 1910: Stratigraphische Untersuchungen im griechischen Mesozoikum und Paläozoikum. — Jb. k.-k. Geol. Reichsanst., Bd. LX, pp. 421—636, pls. XVIII—XXII.

Riche A. and Roman F. 1921: Le Montagne de Crussol. — Trav. Lab. Géol. Univ. Lyon, fasc. 1, pp. 1—196, pls. I—VIII.

Roché P. 1939: Aalenien et Bajocien du Máconnais et de quelques régions voisines. — Trav. Lab. Géol. Univ. Lyon, fasc. 35, Mém. 29, pp. 1—355, pls. I—XIII.

Roché P. 1943: Sur les couches dites à Ammonites Blagdeni du Mont d'Or Lyonnais. — Trav. Lab. Géol. Univ. Lyon, fasc. 36, Mém. 30, pp. 1—36, pls. I—II.

Roemer J. 1911: Die Fauna der Aspidoides-Schichten von Lechstedt bei Bielefeld. — Inaug. Diss. Philos. Fak. Univ. Göttingen, pp. 1—64, pls. 1—12.

Rollier L. 1909: Phyllogénie des principaux genres d'ammonites de l'oolithique (Dogger) et de l'Oxfordien. — Arch. Sci. Phys. Nat. Genéve, 4, Vol. XXVIII, pp. 611—623.

Rollier L. 1911: Les faciès du Dogger ou oolitique dans le Jura et les régions voisines. — Mém. Fond. Schnyder von Wartensee, pp. V+352. Zürich.

Roman F. 1913: Étude sur la faune de céphalopodes de l'Aalénien supérieur de la vallée du Rhone (Zone à Ludwigia concava). — Ann. Soc. Linn. Lyon, N. S., Vol. LX, pp. 1—69, pls. I—IV.

Roman F. 1924: Études sur le Callovien de la vallée de Rhone. I. Le Callovien de Naves. — Trav. Lab. Géol. Univ. Lyon, Fasc. 6, Mém. 5, pp. 1—128, pls. I—XII.

Roman F. 1930: Paléontologie. In: Savorin J., Roman F. and Dareste de la Chavanne J.: Le région d'Oujda. — Notes Mém. Serv. Min. Maroc, pp. 7—22, pls. VII—IX.

Roman F. 1933: Note sur la Bathonien inférieur du Djebel-es-Sekika prés Nemous (départ. d'Oran). — Bull. Soc. Géol. France, Sér. 5, t. III, pp. 57—73, pl. II.

Roman F. 1935: La faune des Minerais de Fer des environs de Privas. — Trav. Lab. Géol. Univ. Lyon, fasc. 27, Mém. 23, pp. 1—52, pls. I—VIII.

Roman F. 1938: Les ammonites jurassiques et crétacées. Essai de genera. — Masson et Cie, Paris, pp. 1—554, pls. 1—53.

Roman F. and Gennevaux M. 1912: Étude sur les terrains jurassiques de la région du Pic Saint-Loup. Fasc. I. Jurassique inférieur et moyen (Lias, Aalenien, Bajocien, Bathonien). — Montpellier, Libr. L. Valat. pp. 1—120, pls. I—VIII.

Roman F. — Pétouraud C. 1927: Étude sur la faune du Bajocien supérieur du Mont d'Or Lyonnais (Ciret). I. Céphalopodes. — Trav. Lab. Géol. Univ. Lyon, fasc. 11, Mém. 9, pp. 1—55, pls. I—VII.

Romanov L. F. 1969: (Partschiceras abichi Uhlig and Oppelia subradiata Sow. ammonite finds in the Jurassic deposits of the Predobrudja anticline.) (In Russian.) — Izv. Akad. Nauk Moldav. S. S. R., Ser. Biol., Chim. Nauk, 2, pp. 81—83, pls. I—II.

Rousseau L. 1841: Description des principaux fossiles de la Crimée. In: Demidoff A.: Voyage dans la Russie méridional et la Crimée. — Edit. Bourdin, Paris, 2808 p., 206 pl.

Sachariewa-Kowatschewa K. 1956: Faunistische und stratigraphische Untersuchung des Doggers im westlichen Balkan. (In Bulgarian, with German abstract.) — Ann. Univ. Sofia, Fac. Biol., Géol., Géogr., Vol. XLIX, 2. Géol. (1954—55), pp. 217—234, pls. I—XIX.

Sapunov I. 1963: The ammonites of the Bajocian genus Protoecotraustes Spath (Haploceratidae). (In Bulgarian, with English abstract.) — Trav. Géol. Bulg., Acad. Sci. Bulg., Sér. Paléont., Vol. V, pp. 149—164, pl. I.

Sapunov I. and Nachev I. 1959: Ammonite fauna of the Jurassic in the southern part of the western section of the Balkan Range. — Trav. Géol. Bulg., Acad. Sci. Bulg., Sér. Paléont., Vol. I, pp. 51—93, pls. I—X.

Sato T. 1962: Le Jurassique du Japon. Zones d'Ammonites. — Coll. Jurassique Luxembourg, 1962. C. R. Mém., pp. 885—896.

Sayn G. and Roman F. 1928: Monographie stratigraphique et paléontologique du Jurassique moyen de la Voult-sur-Rhone. — Trav. Lab. Géol. Univ. Lyon, fasc. 1, Mém. 11, pp. 1—166, pls. I—XII.

Scheurlen H. 1928: Strigoceras und Phlycticeras. — Palaeontographica, 70, pp. 1—40, pls. I—IV.

Schindewolf O. H. 1925: Entwurf einer Systematik der Perisphincten. — N. Jb. Min. Geol. Pal., Beil.-Bd. LII, pp. 309—343.

Schindewolf O. H. 1951: Zur Morphogenie und Terminologie der Ammoneen-Lobenlinie. — Paläont. Z., Vol. 25, pp. 11—34, pl. I.

Schindewolf O. H. 1953: Über Strenoceras und andere Dogger-Ammoniten. — N. Jb. Geol. Paläont. Mh. 1953., pp. 119—130.

Schindewolf O. H. 1961—1968: Studien zur Stammesgeschichte der Ammoniten. Lief. I—VII. — Abh. Akad. Wiss. Lit., Math.-Nat. Kl., pp. 1—901, pls. 1—3.

Schindewolf O. H. 1963: Acuariceras und andere heteromorphe Ammoniten aus dem Oberen Dogger. — N. Jb. Geol. Paläont. Abh., 116, 2, pp. 119—148.

Schlippe A. O. 1888: Die Fauna des Bathonien im oberrheinischen Tieflande. — Abg. Geol. Spezialk. Els.-Lothar., IV. H. 4, pp. 1—264, pls. 1—8.

Schloenbach U. 1865: Beiträge zur Paläontologie der Jura- und Kreide-Formazion im Nordwestlichen Deutschland. I. Über neue und weniger bekannte jurassische Ammoniten. — Palaeontographica 13, pp. 147—192, pls. XXVI—XXXI.

SCHMIDTILL E. and KRUMBECK L. 1931: Über die Parkinsonien-Schichten Nordbayerns mit besonderer Berücksichtigung der Parkinsonien-Schichten Nordwestdeutschland. — Jb. Preuss. Geol. Landesanst. 51, pp. 819—894, pls. LXXXII—XCI.

SCHMIDTILL E. and KRUMBECK L. 1938: Die Coronaten-Schichten von Auerbach (Oberpfalz, Nordbayern) — Zeitschr. Deutsch. Geol. Ges., 90, pp. 297—360, pls. 10—14.

SIEMIRADZKI J. 1898—1899: Monographische Beschreibung der Ammonitengattung Perisphinctes. — Palaeontographica 45, pp. 69—352, pls. XX—XXVII.

SIEMIRADZKI J. 1923: Fauna utworow liasowych i jurasskich Tatr i Podhala. — Arch. Towar. Nauk Lwow, 3, pp. 14—66. pls. 1—8.

SIMIONESCU I. 1899: Studii geologice si paleontologice din Carpati Sudici. III. Fauna Calloviana din Valea Lupului (Rucar). — Publ. Fond. V. Adamanchii, Acad. Rom., No. III, pp. 191—230, pls. I—III.

SIMIONESCU I. 1905: Les Ammonites jurassiques de Bucegi. — Ann. Sc. Univ. Jassy, pp. 1—29, pls. I—IV.

SOWERBY J. and SOWERBY J. DE C. 1812—1846: Mineral Conchology. — 7 vols., pls. 1—337 (1812—22): SOWERBY J.; pls. 338—648 (1822—1846): SOWERBY J. DE C.

SPATH L. F. 1920: On Jurassic ammonites from East Africa, collected by Prof. J. W. Gregory. — Geol. Mag., 57, Vol. LVIII, pp. 311—320, 351—362.

SPATH L. F. 1923—1943: A monograph of the Ammonoidea of the Gault. — Palaeontogr. Soc., X + 787 p., 72 pl.

SPATH L. F. 1924: On the Blake Collection of ammonites from Kachh (Cutch). — Palaeont. Indica, N. S. 9, 1, pp. 1—30.

SPATH L. F. 1927—1933: Revision of the Jurassic Cephalopod Fauna of Kachh (Cutch). — Palaeont. Indica, N. S. 9, 2, Pt. I—VI, pp. 1—945. pls. I—CXXXIII.

STANKEVICH E. S. 1964: (Jurassic ammonites of the sandy-clay deposits of the northwestern Caucasus.) (In Russian.) — Moscow—Leningrad, pp. 1—93, pls. I—XX.

STEHN E. 1924: Beiträge zur Kenntnis des Bathonien und Callovien in Südamerika. — N. Jb. Min. Geol., Beil.-Bd. XLIX, pp. 52—158, pls. 1—8.

STEINMANN G. 1890: In: STEINMANN G. and DÖDERLEIN L.: Elemente der Paläontologie. — Leipzig, pp. 1—848

STEPHANOV J. 1961: The Bathonian in the section of the Belogradchik-Gara Oreshets road (North-West Bulgaria). — Izv. Geol. Inst. Bolg. Akad. Nauk, 9, pp. 337—369, pls. I—VII.

STEPHANOV J. 1963: Bathonian ammonites of the Superfamily Stephanocerataceae in Bulgaria. — Trav. Géol. Bulg., Acad. Sci. Bulg., Sér. Paléont., 5, pp. 167—209, pls. I—VI.

STEPHANOV J. 1966: The Middle Jurassic ammonite genus Oecotraustes Waagen. — Trav. Géol. Bulg., Acad. Sci. Bulg., Sér. Paléont., 8, pp. 29—69, pls. 1—7.

STEPHANOV J. 1972: Monograph on the Bathonian ammonite genus Siemiradzkia Hyatt, 1900. (Nomenclature, taxonomy and phylogeny). — Bull. Geol. Inst., Ser. Paleont., Vol. XXI, pp. 5—82, pls. I—XVI.

STRÉMOOUKHOFF D. 1898: Note sur le Phylloceras Zignodianum d'Orb. et le Lytoceras Adelae d'Orb. des schistes de Balaclava. — N. Mém. Soc. Imp. Nat. Moscou, 15, 7, pp. 389—396, pls. I—II.

STURANI C. 1964a: La successione delle faune ad Ammoniti nelle formazioni mediogiurassiche delle Prealpi Venete occidentali. — Mem. Ist. Geol. Min. Univ. Padova, Vol. 24, pp. 1—65, pls. I—VI.

STURANI C. 1964b: Ammoniti mediogiurassiche del Veneto. Faune del Bajociano terminale (zone a Garantiana e a Parkinsoni). — Mem. Ist. Geol. Min. Univ. Padova, vol. 24, pp. 1—43, pls. I—IV.

STURANI C. 1966: Ammonites and stratigraphy of the Bathonian in the Digne-Barréme area. — Boll. Soc. Paleont. Ital., Vol. 5, No. 1, pp. 3—57, pls. 1—24.

STURANI C. 1971: Ammonites and stratigraphy of the "Posidonia alpina" beds of the Venetian Alps (Middle Jurassic, mainly Bajocian). — Mem. Ist. Geol. Min. Univ. Padova, Vol. 27, pp. 1—190, pls. I—XVI.

SUESS E. 1865—1870: Über Ammoniten. I—II. — Abth. Sitzungsb. k. Akad. Wiss., Math.-Nat. Kl., Bd. 52, pp. 71—89; Bd. 61, pp. 305—322.

THALMANN H. 1925: Ein neuer Ammonit aus dem alpinen Bathonien. Coeloceras (Stephanoceras) Arbenzi nov. sp. — Ecl. Geol. Helv., 19, 1, pp. 205—207.

THÉOBALD N. and BOURQUIN J. 1957: Récentes découvertes d'Ammonites dans le Bajocien du Jura franc-comtois. — Bull. Soc. Hist. Nat. Doubs, No. 61, pp. 27—57, pls. I—II.

THIERRY J. 1976: Paléobiogéographie de quelques Stephanocerataceae (Ammonitina) du Jurassique moyen et supérieur; une confrontation avec la théorie mobiliste. — Geobios, No. 9, fasc. 3, pp. 291—331.

TILL A. 1910: Die Ammonitenfauna des Kelloway von Villány (Ungarn), II. — Abt. Beitr. Paläont., Geol. Österr.—Ung., Orients, Bd. XXIII, pp. 251—272, pls. XVI—XIX.

TORRENS H. S. 1967a: Standard zones of the Bathonian. — Coll. Jurassique Luxembourg, 1967, Mém. B. R. G. M. Fr., No. 75. (1971), pp. 581—604.

TORRENS H. S. 1967b: The Great Oolite Limestone of the Midlands. — Trans. Leic. Lit. Phil. Soc., Vol. LXI, pp. 65—90.

TORRENS H. S. 1968: Some Fuller's Earth sections in the S. Cotswolds. — Proc. Bristol Nat. Soc., 31, 4, pp. 429—438.

TORRENS H. S. 1969a (Ed.): International Fiel Symposium on the British Jurassic. Excursion No. 1. Guide for Dorset and South Somerset. — Geol. Dpt. Keel. University, pp. A1—A71.

TORRENS H. S. 1969b: The stratigraphical distribution of Bathonian ammonites in Central England. — Geol. Mag., Vol. 106, No. 1, pp. 63—76.

TORRENS H. S. 1971: New names for two microconch ammonite genera from the Middle Bathonian (Jurassic) of Europe and their macroconch counterparts. — Boll. Soc. Paleont. Ital., Vol. 9, No. 2. (1970), pp. 136—148, pl. 36.

TOZER E. T. 1971: One, two or three connecting links between Triassic and Jurassic ammonoids? — Nature, Vol. 232, No. 5312, pp. 565—566.

Trauth F. 1923: Über eine Doggerfauna aus dem Lainzer Tiergarten bei Wien. — Ann. Naturhist. Mus. Wien, 36, pp. 105—246, pl. II.

Tsereteli J. 1968: Les ammonites bathoniennes de la Georgie. — Tbilisi, pp. 1—100, pls. I—XIV.

Tsytovitch X. de 1911: Hecticoceras du Callovien de Chézery. — Mém. Soc. Paléont. Suisse, Vol. 37, pp. 1—84, pls. 1—8.

Tsytovitch X. de 1912: Sur quelques ammonites calloviennes de la Crimée et du Mangyschlak. — Ann. Géol. Min. Russie, Vol. 14, 7—8, pp. 195—199, pl. II.

Uhlig V. 1881: Über die Fauna des rothen Kellowaykalkes der pienninischen Klippe Babierzowka bei Neumarkt, in Westgalizien. — Jb. k.-k. Geol. Reichsanst., XXXI, pp. 381—424, pls. VIII—IX.

Vilanova J. P. 1856: Memoria geognóstico-agricola sobre la provincia de Castellón. — Mem. R. Cienc. Madrid, t. IV. pp. 1—575.

Waagen W. 1869: Die Formenreiche des Ammonites subradiatus. — In: Benecke: Geogn. Palaeont. Beitr., Vol. II, H. 2, pp. 181—256, pls. XVI—XX.

Waagen W. 1873—1875: Jurassic fauna of Kutch. The Cephalopoda. — Palaeont. Indica, 9, 1, Part 1—4, pp. 1—247, pls. I—LX.

Wendt J. 1964: Stratigraphisch-paläontologische Untersuchungen im Dogger Westsiziliens. — Boll. Soc. Paleont. Ital., Vol. 2, No. 1, (1963), pp. 57—145, pls. 6—24.

Wendt J. 1971: Genese und Fauna submariner sedimentärer Spaltenfüllungen im Mediterranen Jura. — Palaeontographica, 136, Abt. A, pp. 121—192.

Westermann G. 1954: Monographie der Otoitidae (Ammonoidea). Otoites, Trilobiticeras, Itinsaites, Epalxites, Germanites, Masckeites (Pseudotoites, Polyplectites), Normannites. — Beih. Geol. Jb., H. 15, pp. 1—364, pls. 1—33.

Westermann G. 1956a: Monographie der Bajocien-Gattungen Sphaeroceras und Chondroceras (Ammonoidea). — Beih. Geol. Jb., H. 24, pp. 1—125, pls. 1—14.

Westermann G. 1956b: Phylogenie der Stephanoceratacеae und Persisphinctaceae des Dogger. — N. Jb. Geol. Paläont. Abh., 103, 3, pp. 233—279.

Westermann G. 1958: Ammoniten-Fauna und Stratigraphie der Bathonien NW-Deutschlands. — Beih. Geol. Jb., H. 32, pp. 1—103, pls. 1—49.

Westermann G. E. G. 1964: Sexual-Dimorphismus bei Ammonoideen und seine Bedeutung für die Taxonomie der Otoitidae (einschliesslich Sphaeroceratinae; Ammonitina, M. Jura). — Palaeontographica, 124, A, pp. 33—73, pls. 6—9.

Westermann G. E. G. 1967a: Ammonite succession of the Middle Jurassic in the Southern Andes. — Coll. Jurassique, Luxembourg, 1967, Mém. B. R. G. M. Fr., No 75. (1971), pp. 423—430.

Westermann G. E. G. 1967b: Jurassique moyen (Alpes exclues). — Lex. Strat. Intern., Europe, Allemagne, fasc. 5 f 2, pp. 1—197.

Westermann G. E. G. 1969: The ammonite fauna of the Kialagvik Formation at Wide Bay, Alaska Peninsula. Part II, Sonnina sowerbyi Zone (Bajocian). — Bull. Amer. Paleont., Vol. 57, No. 255, pp. 1—226, pls. 1—47.

Westermann G. E. G. 1975: Bajocian ammonoid fauna of Tethyan affinities from the Kambe Limestone Series. of Kenya and implication to plate tectonics. — Newsl. Stratigr., 4, 1, pp. 23—48, pls. 1—2.

Westermann G. E. G. and Getty T. A. 1970: New Middle Jurassic Ammonitina from New Guinea. — Bull Amer. Paleont., Vol. 57, No. 256, pp. 231—321, pls. 48—62.

Westermann G. E. G. and Riccardi A. C. 1972: Middle Jurassic ammonoid fauna and biochronology of the Argentine-Chilean Andes. Part I: Hildoceratacеae. — Palaeontographica, 140, A, pp. 1—116, pls. 1—31.

Westermann G. E. G. and Rioult M. 1975: The lectotype of the ammonite Cadomites psilacanthus (Wermbter). — Palaeontology, Vol. 18, 4, pp. 971—977, pl. 105.

Wetzel W. 1911: Faunistische und stratigraphische Untersuchung der Parkinsonienschichten des Teutoburger Waldes bei Bielefeld. — Palaeontographica 58, pp. 139—278, pls. XI—XX.

Wetzel W. 1924: Beiträge zur Stratigraphie und Paläontologie des mittleren Doggers von Nordwesteuropa. — Palaeontographica, 65, pp. 155—247.

Wetzel W. 1937: Studien zur Paläontologie des nordwesteuropäischen Bathonien. — Palaeontographica 87, A, pp. 77—157, pls. X—XV.

Wetzel W. 1950: Fauna und Stratigraphie der Wuerttembergica-Schichten insbesondere Norddeutschlands. — Palaeontographica 99, A, pp. 63—120, pls. VII—IX.

Wetzel W. 1954: Die Bielefelder Garantianen; Geschichte einer Ammonitengattung. — Geol. Jb., 68, pp. 547—586, pls. 11—14.

Wetzel W. 1966: Über einige umstrittene Bath-Ammoniten nebst paläobiologischen Bemerkungen über die Neoammoniten. — N. Jb. Geol. Paläont. Abh., 124, 1, pp. 84—102, pls. 12—14.

Wiedmann J. 1963: Unterkreide-Ammoniten von Mallorca. 2. Lief.: Phylloceratina. — Abh. Akad. Wiss. Lit., Math.-Nat. Kl., 1963, Nr. 4, pp. 157—264, pls. 1—11.

Wiedmann J. 1969: The heteromorphs and ammonoid extinction. — Biol. Rev., Vol. 44, pp. 563—602, pls. 1—3.

Wiedmann J. 1970: Über den Ursprung der Neoammonoiden. — Das Problem einer Typogenese. — Ecl. Geol. Helv., 63, 3, pp. 923—1020.

Wiedmann J. 1973: Evolution or revolution of ammonoids at Mesozoic system boundaries. — Biol. Rev., Vol. 48, pp. 159—194.

Wormbs J. 1976: Zur Stratigraphie und Biofazies des Doggers im Nordteil der DDR auf der Grundlage der Makrofauna. — Jb. Geol., Bd. 5/6. (1969—70), pp. 329—365, pls. I—V.

Zatwornitzky A. 1914: Mesojurassische Tone im Tale des Kuban (NW Caucase). — Bull. Com. Géol. Pétrograde, 33, No. 5, pp. 525—558, pls. XVI—XVII.

ZEISS A. 1956: Hecticoceras und Reineckeia im Mittel- und Ober-Callovien von Blumberg (Südbaden). — Abh. Bayr. Akad. Wiss., Math.-Nat. Kl., N. F., H. 80, pp. 1—101, pls. 1—4.

ZEISS A. 1959: Hecticoceratinae (Ammonoidea jurassica). In: Fossilium Catalogus, I. Animalia, Pars 96. — W. Junk, Gravenhage, pp. 1—143.

ZESASHVILI V. I. 1963: (Some representatives of the western Georgian Middle Jurassic faunas.) (In Russian.) — Trudy Inst. Akad. Nauk Georg. S. S. R., Ser. Geol., XIII, pp. 5—35.

ZIEGLER B. 1958: Monographie der Ammonitengattung Glochiceras im epikontinentalen Weissjura Mitteleuropas. — Palaeontographica 110, A. pp. 93—164, pls. 10—16.

ZIETEN C. H. VON 1830—1833: Die Versteinerungen Württembergs. — Stuttgart, pp. 1—102, pls. 1—72.

ZITTEL K. A. 1869: Bemerkungen über Phylloceras tatricum Pusch sp. und einige andere Phylloceras-Arten. — Jb. k.-k. Geol. Reichsanst., 19, pp. 59—68, pl. 1.

ZITTEL K. A. 1868a: Paläontologische Notizen über Lias-, Jura- und Kreide-Schichten in den baierischen und österreichischen Alpen. — Jb. k.-k. Geol. Reichsanst., 18, pp. 599—610.

ZITTEL K. A. 1868b: Die Cephalopoden der Stramberger Schichten. — Paläont. Mitt. Mus. I. Bayer.-Staates, Bd. 2, Pt. 1, pp. 33—118, pls. I—XXIV.

ZITTEL K. A. 1870: Die Fauna der älteren Cephalopoden-führenden Tithonbildungen. — Palaeontographica, Suppl. Bd. 1, pp. 119—310, pls. XXV—XXXIX.

ZITTEL K. A. 1884: Handbuch der Palaeontologie. Abt. I, Palaeozoologie, Bd. II. Mollusca und Arthropoda. — München—Leipzig, pp. 329—522.

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CONTENTS OF THE SYSTEMATIC DESCRIPTIONS

АММОНИТЫ БАЙОССКОГО И БАТСКОГО ЯРУСОВ ОКОЛО ХУТОРА ДЬЕНЕШПУСТА (ГОРЫ БАКОНЬ, ВНР)

А. Галац

В районе хутора Дьенешпуста (Северная Баконь, Задунайское среднегорье) юрские отложения с аммонитами вскрыты в шести разрезах. Толща байосско-батских известняков аммонитико россо несогласно налегает на известняки типа дахштейн, представляющие собою низы юры, и перекрывается радиоляритами. Батская аммонитовая фауна красных известняков в районе хутора Дьенешпуста является единственной находкой в толщах, до сих пор изученных в пределах Задунайского среднегорья, так как фациальная смена известняков радиоляритами в других разрезах имеет место уже в байосском ярусе.

Послойные сборы аммонитов из разреза VI, больше всего поддающегося расчленению, дали богатейшую аммонитовую фауну. На основании более 4000 экземпляров из байосского яруса удалось выявить 4 верхних зоны (C Humphriesianum, Subfurcatum, Garantiana, Parkinsoni), из батского яруса также 4 зоны (C Zigzag, Progracilis, Subcontractus, Retrocostatum). В связи с сильной конденсацией толщи и отсутствием некоторых стратиграфически важных аммонитов расчленение толщи на подзоны не было осуществимым.

Как количественная, так и качественная оценка аммонитовой фауны доказывает типично тетисский характер комплекса, характеризующегося высокой долей представителей *Phylloceras* и *Lytoceras*. Большое разнообразие родового и видового составов также свидетельствует о наличии фауны тетисского характера. В фауне представлены исключительно роды тетисских семейств и подсемейств аммонитов.

Что касается диморфизма аммонитов, то рассматриваемая фауна не умаляет сомнения в справедливости концепции, объясняющей это явление половым размножением аммонитов.

В систематической части описаны 83 вида 37 родов 12 семейств. В описании отдельных родов в сжатой форме приводятся данные об их стратиграфическом и палеогеографическом распространении, филогенетических связях и диморфизме. Дополняя видовые описания обильными синонимиками и примечаниями, автор работы постарался осуществить некоторую ревизию верхнебайосских и батских аммонитов Средиземноморской области.

Среди описанных видов имеется 7 новых: 4 из верхнебайосских отложений *[Adabofoloceras hajagense, Ptychophylloceras triplicatum, Cadomites (C.) sturanii, Dimorphinites (D.) compressus]* и 3 из батских *[Lissoceras magnum, Bullatimorphites stephanovi, Choffatia (C.) densidecorata]*.

PLATES

PLATE I

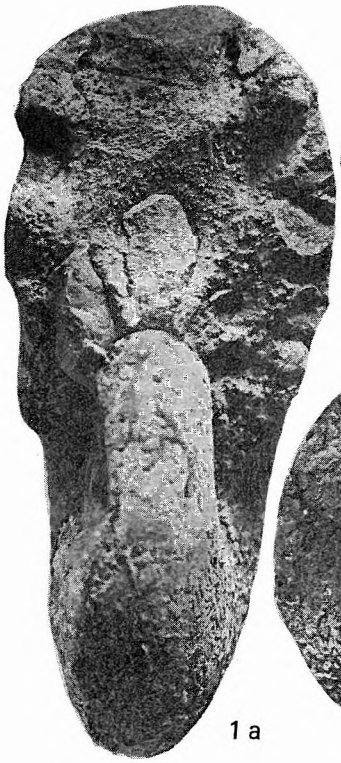
Figs. 1a—c. *Phylloceras trifoliatum* NEUMAYR, Profile VI, Bed 15, Parkinsoni Zone (J9246)

Fig. 2. *Phylloceras trifoliatum* NEUMAYR, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9248)

Fig. 3. *Phylloceras trifoliatum* NEUMAYR, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9247)

Fig. 4. *Phylloceras isomorphum* GEMMELLARO, Profile VI, Bed 14, Parkinsoni Zone (J9201)

All photos natural size



1 a

1 b

1 c

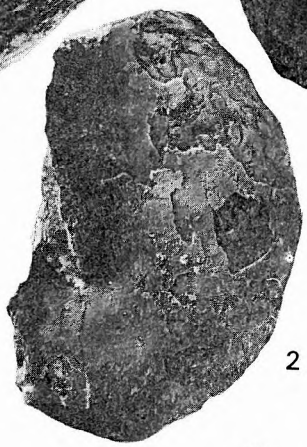


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PLATE II

Fig. 1. *Phylloceras isomorphum* GEMMELLARO, Profile VI, Bed 14, Parkinsoni Zone (J9205)

Figs. 2a—b. *Phylloceras isomorphum* GEMMELLARO, Profile VI, Bed 15, Parkinsoni Zone (J9204)

All photos natural size

1

2 a

2 b

PLATE III

Fig. 1. *Phylloceras kudernatschi* (HAUER), Profile VI, Bed 10, Zigzag Zone (J9207)

Figs. 2a—b. *Phylloceras kudernatschi* (HAUER), Profile VI, Bed 5, Subcontractus Zone (J9212)

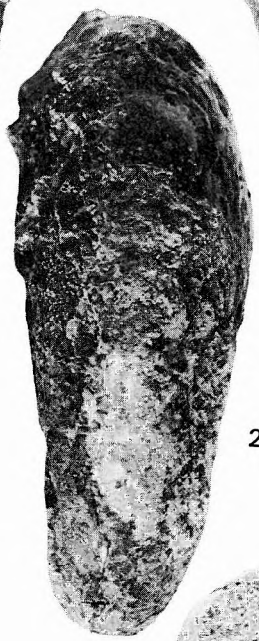
Fig. 3. *Phylloceras kunthi* NEUMAYR, Profile VI, Bed 14, Parkinsoni Zone (J9213)

Fig. 4. *Phylloceras kunthi* NEUMAYR, Profile VI, Bed 14, Parkinsoni Zone (J9214)

All photos natural size

1

2 a



2 b

3

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PLATE IV

Fig. 1. *Adabofoloceras hajagense* n. sp. Holotype, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9218)

Figs. 2a—b. *Adabofoloceras hajagense* n. sp. Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9217)

Figs. 3a—b. *Adabofoloceras hajagense* n. sp. Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9216)

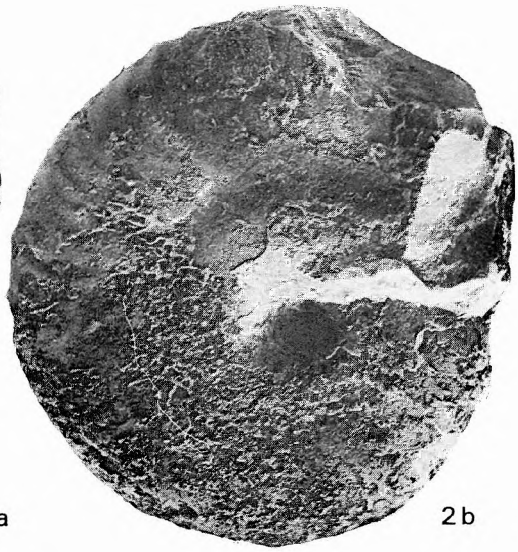
Figs. 4a—b. *Adabofoloceras subobtusum* (KUDERNATSCH), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9221)

Figs. 5a—b. *Adabofoloceras subobtusum* (KUDERNATSCH), Profile VI, Bed 11, Zigzag Zone (J9220)

All photos natural size

1

2a



2b

3a

3b

5a

4a

4b

5b

PLATE V

Fig. 1. *Adabofoloceras* sp. Profile III, Parkinsoni Zone (J9222)

Fig. 2. *Adabofoloceras abichi* (UHLIG), Profile VI, Bed 13, Parkinsoni Zone (J9223)

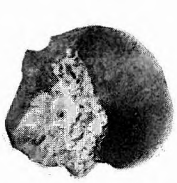
Figs. 3a—b. *Calliphylloceras disputabile* (ZITTEL), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9225)

Fig. 4. *Holcophylloceras zignodianum* (D'ORBIGNY), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9232)

Fig. 5. *Holcophylloceras zignodianum* (D'ORBIGNY), Profile VI, Bed 15, Parkinsoni Zone (J9231)

Figs. 6a—c. *Calliphylloceras disputabile* (ZITTEL), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9224)

All photos natural size



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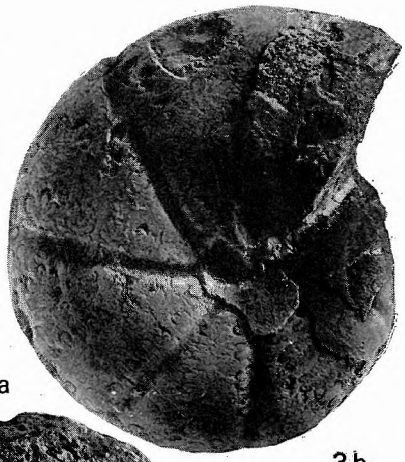

3b

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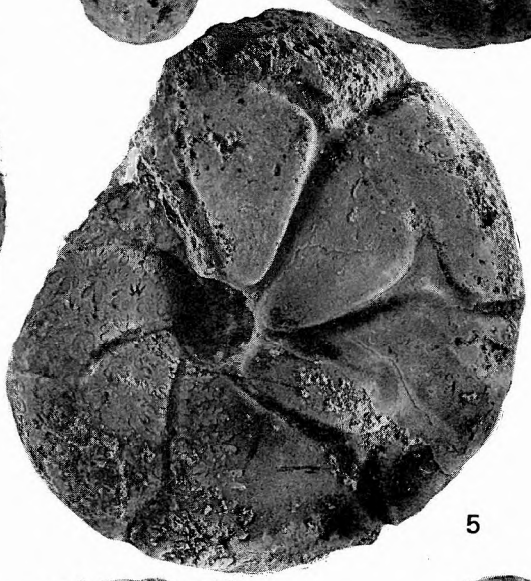

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6a

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PLATE VI

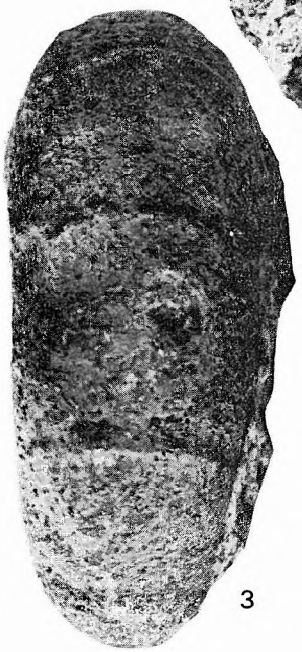
Fig. 1. *Holcophylloceras zignodianum* (D'ORBIGNY), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9230)
(For venter see Pl. VII, fig. 1)

Figs. 2a—b. *Ptychophylloceras flabellatum* (NEUMAYR), Profile VI, Bed 5, Subcontractus Zone (J9240)

Fig. 3. *Ptychophylloceras flabellatum* (NEUMAYR), Profile VI, Bed 5, Subcontractus Zone (J9241)

All photos natural size

1



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2 a

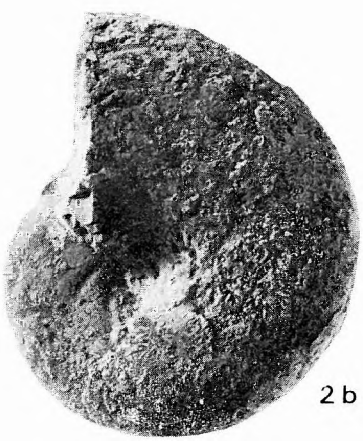

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PLATE VII

Fig. 1. *Holcophylloceras zignodianum* (D'ORBIGNY), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9230) (see Pl. VI, fig. 1)

Figs. 2a—b. *Ptychophylloceras flabellatum* (NEUMAYR), Profile VI, Bed 4, Subcontractus Zone (J9239)

All photos natural size

1

2a

2b

PLATE VIII

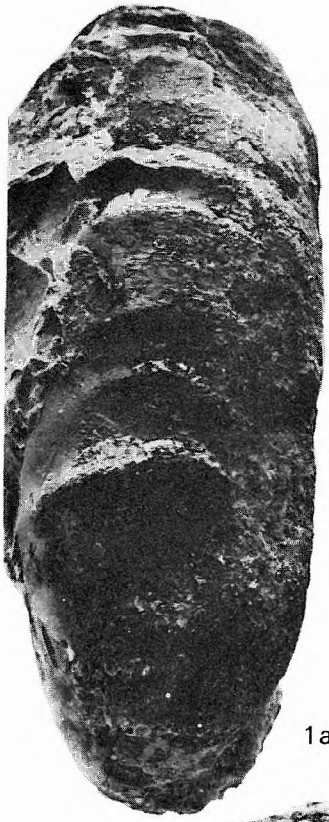
Figs. 1a—b. *Ptychophylloceras triplicatum* n. sp. Holotype, Profile VI, Bed 13, Parkinsoni Zone (J9236)

Fig. 2. *Lytoceras* sp. aff. *eudesianum eudesianum* (D'ORBIGNY), Profile VI, Bed 12, Parkinsoni Zone (J9254). Asterisk indicates constriction

Fig. 3. *Ptychophylloceras triplicatum* n. sp. Profile VI, Bed 13, Parkinsoni Zone (J9239)

Fig. 4. *Lytoceras adelae* (D'ORBIGNY), Profile VI, Bed 14, Parkinsoni Zone (J9259)

All photos natural size



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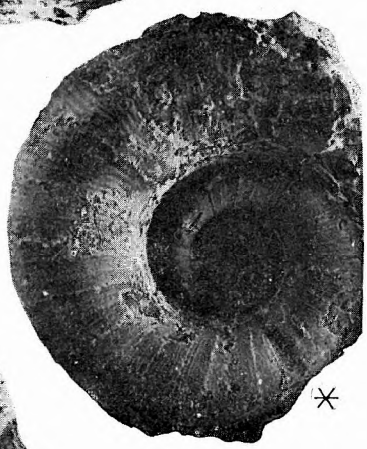

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PLATE IX

Lytoceras eudesianum eudesianum (D'ORBIGNY), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9253)

Natural size

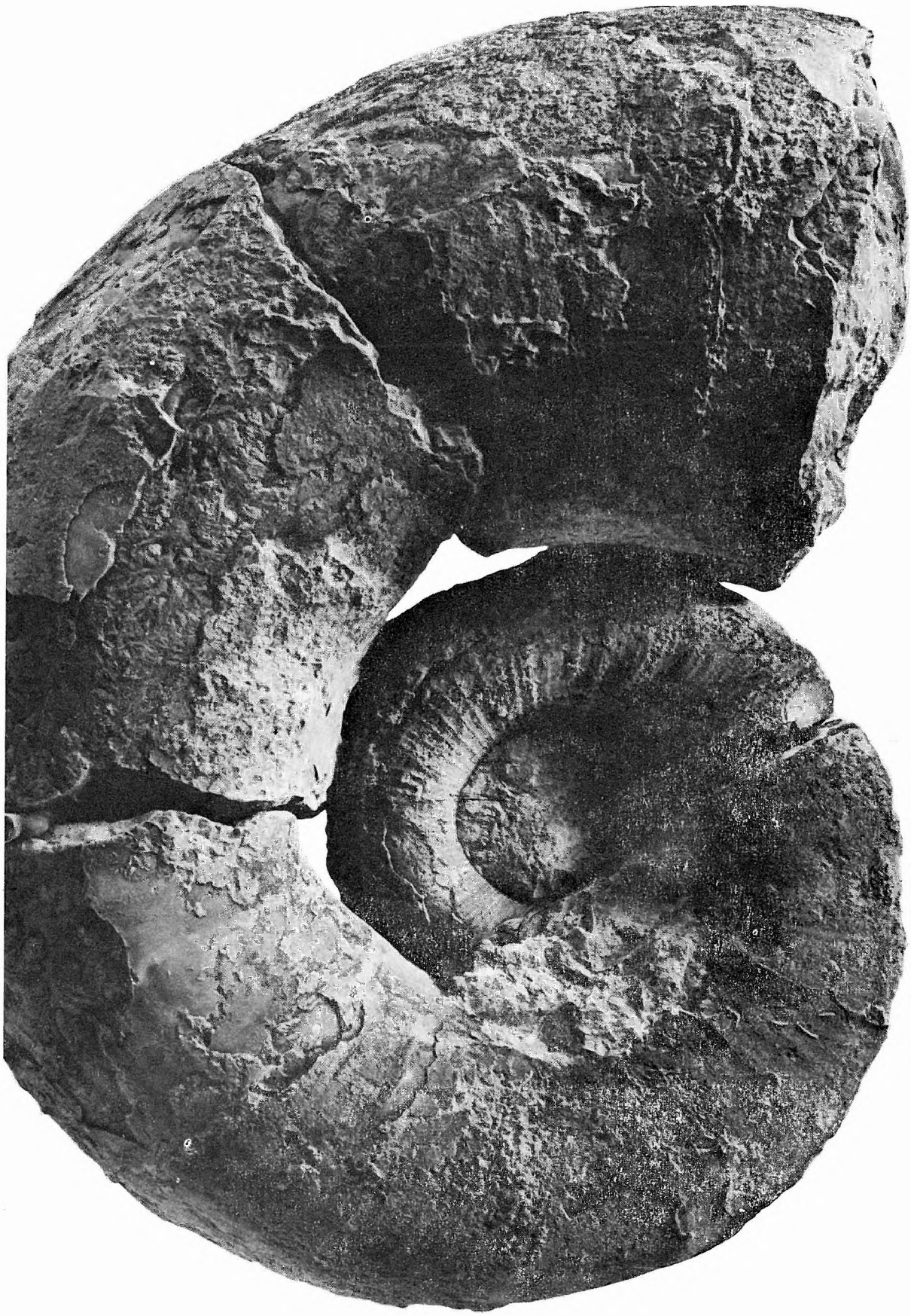

PLATE X

Fig. 1. *Lytoceras eudesianum* (D'ORBIGNY) s. l. Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9255)

Figs. 2a—b. *Nannolytoceras polyhelictum* (BÖCKH), Profile VI, Bed 15, Parkinsoni Zone (J9263)

Figs. 3a—b. *Lytoceras adelae* (D'ORBIGNY), Profile VI, Bed 11, Zigzag Zone (J9258)

All photos natural size

1

2a

2b

3a

3b

PLATE XI

Fig. 1. *Nannolytoceras polyhelictum* (Böckh), Profile VI, Bed 17, Subfurcatum Zone (J9262)

Fig. 2. *Nannolytoceras tripartitum* (Raspail), Profile VI, Bed 12, Zigzag Zone (J9271)

Fig. 3. *Nannolytoceras tripartitum* (Raspail), Profile III, Parkinsoni Zone (J9270)

Fig. 4. *Strigoceras truellei* (d'Orbigny), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9274)

Fig. 5. *Lissoceras oolithicum* (d'Orbigny), Profile VI, Bed 13, Parkinsoni Zone (J9277)

Fig. 6. *Lissoceras oolithicum* (d'Orbigny), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9279)

Figs. 7a—b. *Lissoceras haugi* Sturani, Profile VI, Bed 17, Subfurcatum Zone (J9276)

All photos natural size

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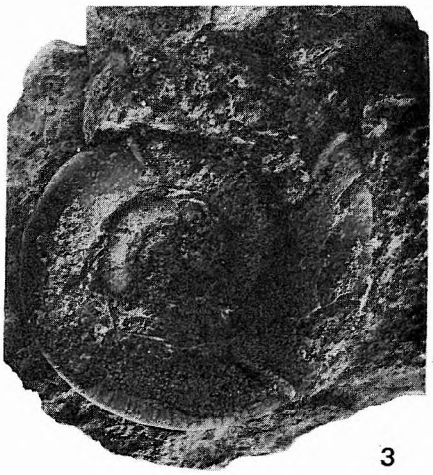

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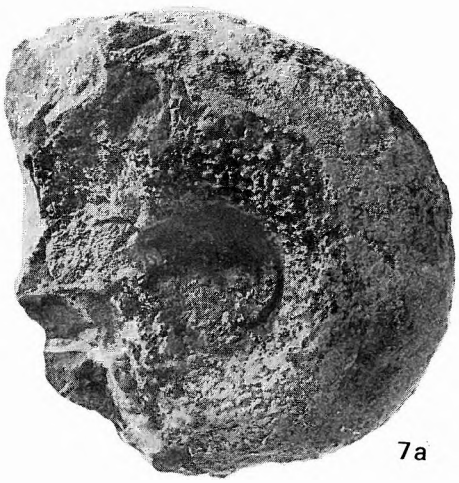

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7b

PLATE XII

Figs. 1a—b. *Lissoceras psilodiscus* (SCHLOENBACH), Profile I, Parkinsoni Zone (J9285)

Figs. 2a—b. *Lissoceras magnum* n. sp. Holotype, Profile VI, Bed 10, Zigzag Zone (J9281)

Figs. 3a—b. *Lissoceras psilodiscus* (SCHLOENBACH), Profile VI, Bed 10, Zigzag Zone (J9284)

All photos natural size


1a
1b
2a
2b
3a
3b

PLATE XIII

Fig. 1. *Lissoceras ferrifex* (ZITTEL), Profile VI, Bed 6, Subcontractus Zone (J9287)

Figs. 2a—b. *Oppelia* cf. *flexa* (BUCKMAN), Profile VI, Bed 13, Parkinsoni Zone (J9296)

Fig. 3. *Oecotraustes (Oecotraustes) costiger* BUCKMAN, Profile VI, Bed 13, Parkinsoni Zone (J9294)

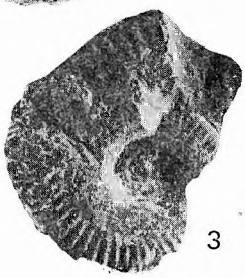
Figs. 4a—b. *Oxycerites plicatella* (GEMMELLARO), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9297)

Fig. 5. *Oecotraustes (Oecotraustes)* cf. *costiger* BUCKMAN, Profile VI, Bed 16, Subfurcatum and Garantiana Zone (J9295)

All photos natural size

1

2a



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2b

4a

4b

5

PLATE XIV

Figs. 1a—b. *Oxycerites plicatella* (GEMMELLARO), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9299)

Figs. 2a—b. *Oxycerites plicatella* (GEMMELLARO), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9298)

Figs. 3a—c. *Prohecticoceras ochraceum ochraceum* ELMI, Profile VI, Bed 3, Subcontractus Zone (J9307)

Figs. 4a—b. *Prohecticoceras ochraceum ochraceum* ELMI, Profile VI, Bed 3, Subcontractus Zone (J9306)

Figs. 5a—b. *Oxycerites* cf. *oxus* (BUCKMAN), Profile VI, Bed 8, Progracilis Zone (J9305)

All photos natural size


1a
1b
2a
2b
3a
3b
3c
4a
4b
5a
5b

PLATE XV

Fig. 1. *Cadomites (Cadomites) deslongchampsi* (D'ORBIGNY), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9323)

Figs. 2a—b. *Cadomites (Cadomites) sturanii* n. sp. Holotype, Profile VI, Bed 15, Parkinsoni Zone (J9329)

Figs. 3a—b. *Cadomites (Cadomites) sturanii* n. sp. Profile VI, Bed 15, Parkinsoni Zone (J9328)

Figs. 4a—b. *Cadomites (Cadomites) orbignyi* DE GROSSOUVRE, Profile VI, Bed 15, Parkinsoni Zone (J9333)

Figs. 5a—b. *Cadomites (Cadomites) daubenyi* (GEMMELLARO), Profile I, Parkinsoni Zone (J9335)

Figs. 6a—b. *Cadomites (Polyplectites) venetus* (PARONA), Profile VI, Bed 13, Parkinsoni Zone (J9356)

All photos natural size

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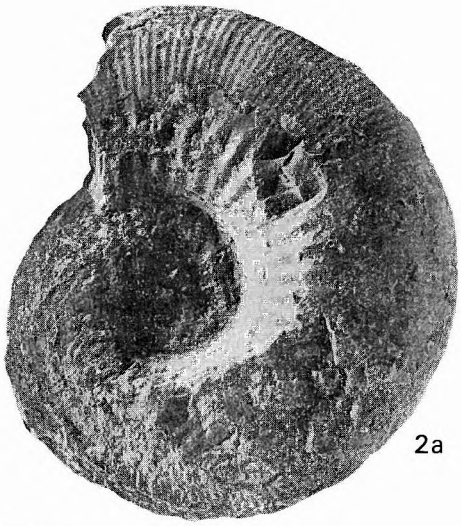


2a

2b

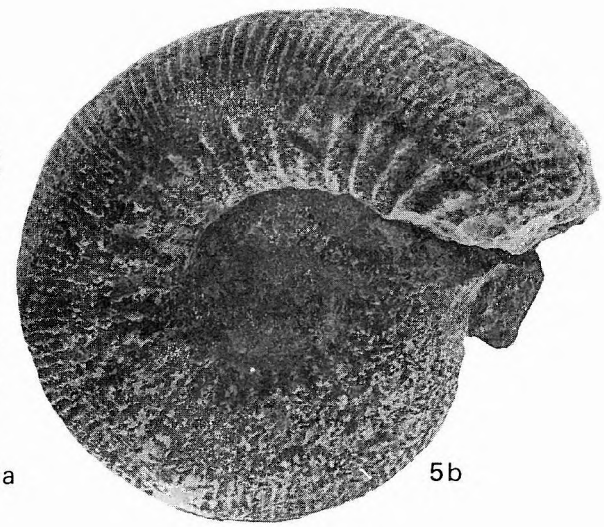
3a

3b

4a

4b

5a



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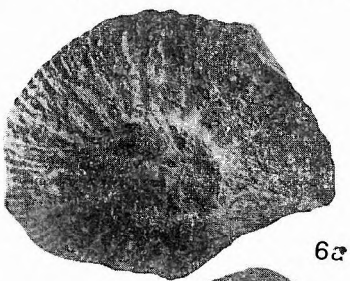


6a

6b

PLATE XVI

Fig. 1. *Cadomites (Cadomites) rectelobatus* (HAUER), Profile VI, Bed 13, Parkinsoni Zone (J9346)

Figs. 2a—b. *Cadomites (Cadomites) rectelobatus* (HAUER), Profile I, Parkinsoni Zone (J9349)

Figs. 3a—b. *Cadomites (Polyplectites) richei* LISSAJOUS, Profile VI, loose specimen, Lower or Middle Bathonian (J9354)

Figs. 4a—b. *Cadomites (Cadomites) exstinctus* (QUENSTEDT), Profile VI, Bed 4, Subcontractus Zone (J9336)

Figs. 5a—b. *Sphaeroceras tenuicostatum tenuicostatum* STURANI, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9358)

Figs. 6a—c. *Cadomites (Polyplectites) zlatarskii* STEPHANOV, Profile VI, Bed 12, Zigzag Zone (J9357)

Figs. 7a—b. *Tulites (Rugiferites) serpenticonus* (ARKELL), Profile VI, Bed 4, Subcontractus Zone (J9317)

All photos natural size

1

2a

2b

3a

3b

4a

4b

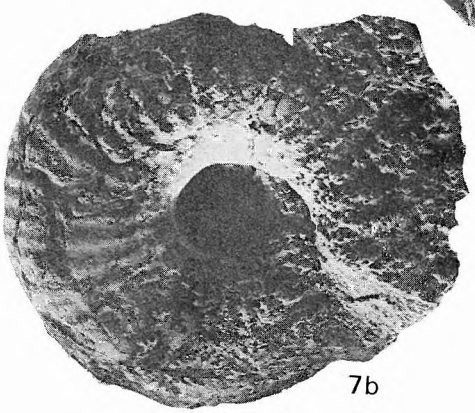
5a

5b

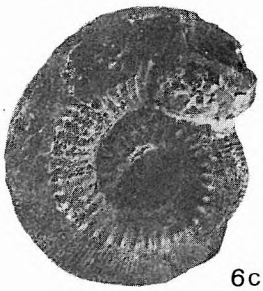
6a

6b

7a



7b



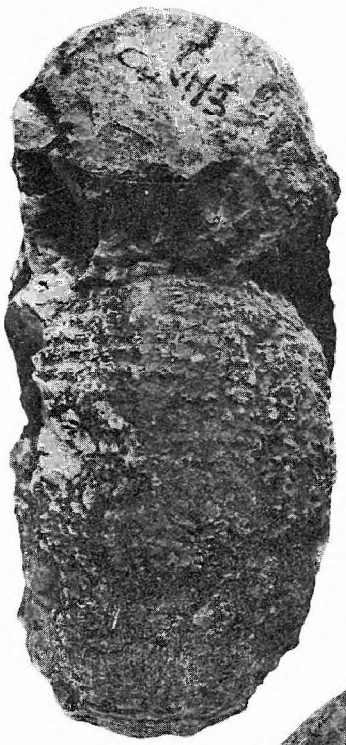
6c

PLATE XVII

Figs. 1a—b. *Bullatimorphites eszterense* (Böckh), Profile VI, Bed 3, Subcontractus Zone (J9309)

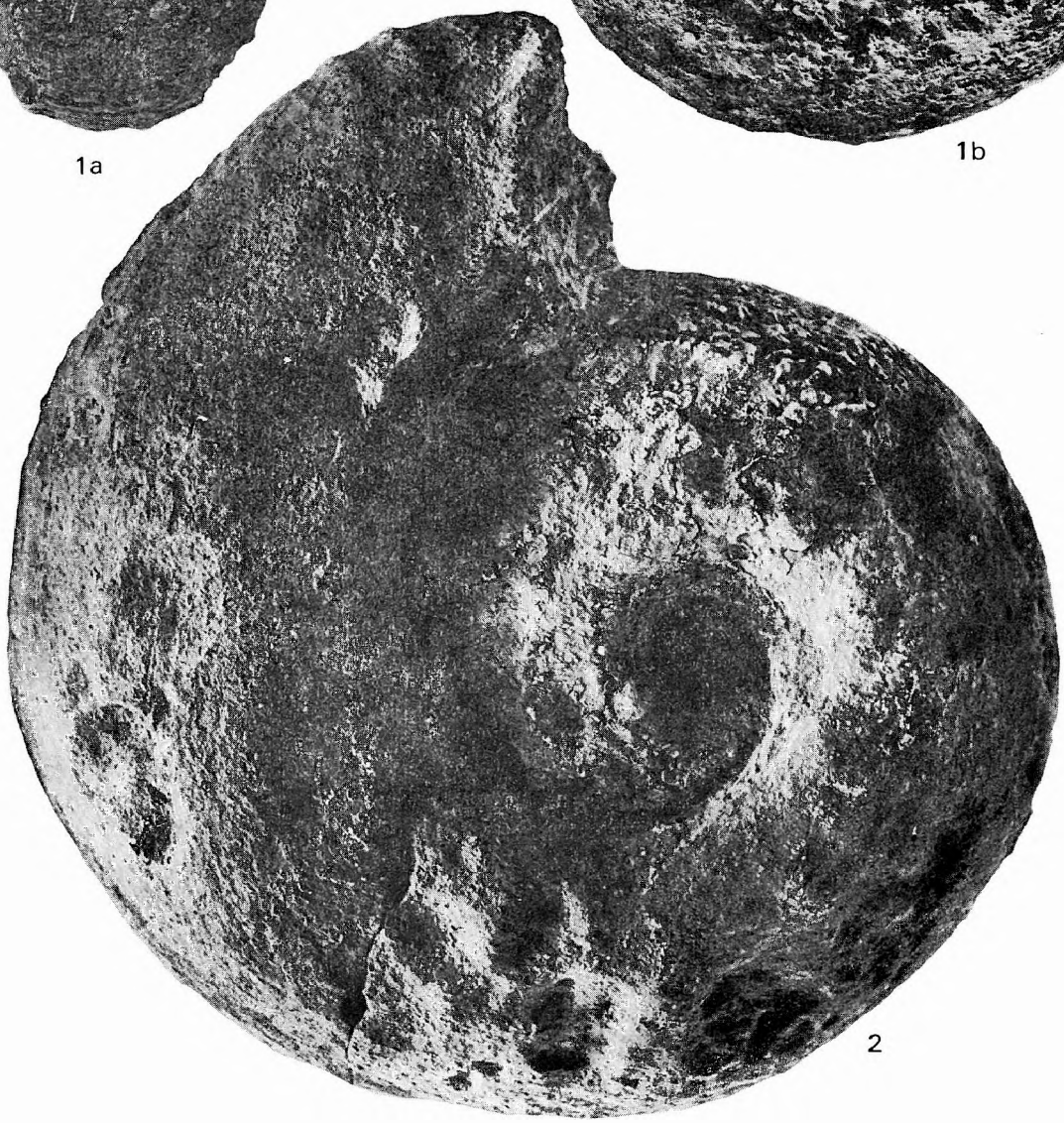
Fig. 2. *Bullatimorphites stephanovi* n. sp. Holotype, Profile VI, Bed 1, Retrocostatum Zone (J9312)
(For ventral view see Pl. XVIII, fig. 1)

All photos natural size



1a

1b



2

PLATE XVIII

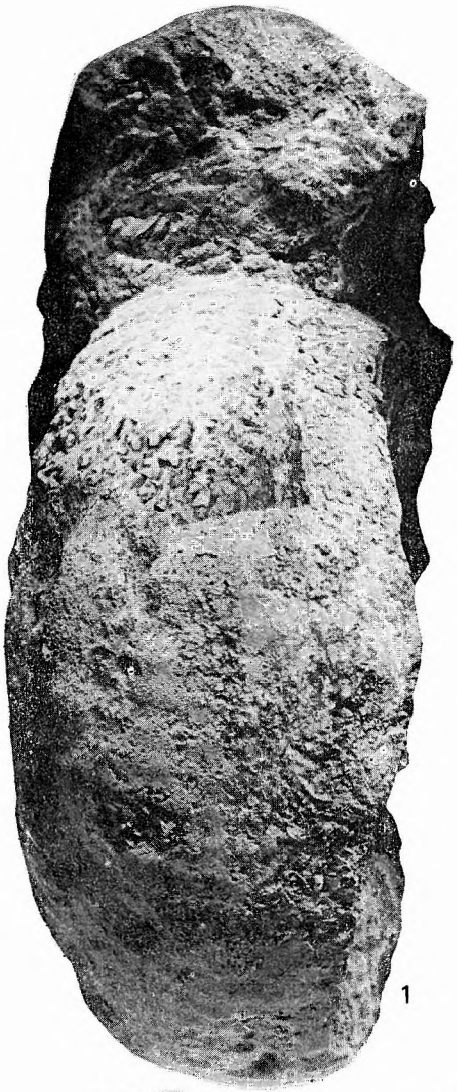
Fig. 1. *Bullatimorphites stephanovi* n. sp. Holotype, Profile VI, Bed 1, Retrocostatum Zone (J9312)
(See Pl. XVII, fig. 2)

Fig. 2. *Bullatimorphites* sp. Profile VI, Bed 1, Retrocostatum Zone (J9314)

Figs. 3a—b. *Tulites (Rugiferites) serpenticonus* (ARKELL), Profile VI, Bed 5, Subcontractus Zone (J9316)

Fig. 4. *Tulites (Rugiferites) serpenticonus* (ARKELL), Profile VI, Bed 4, Subcontractus Zone (J9318)

All photos natural size



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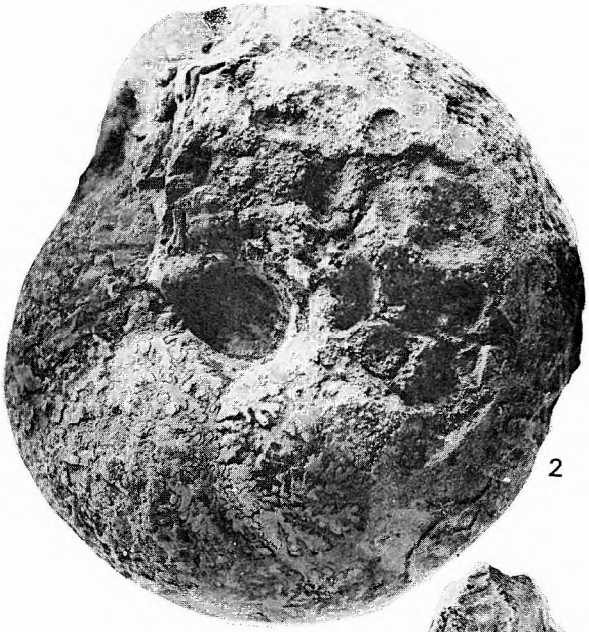
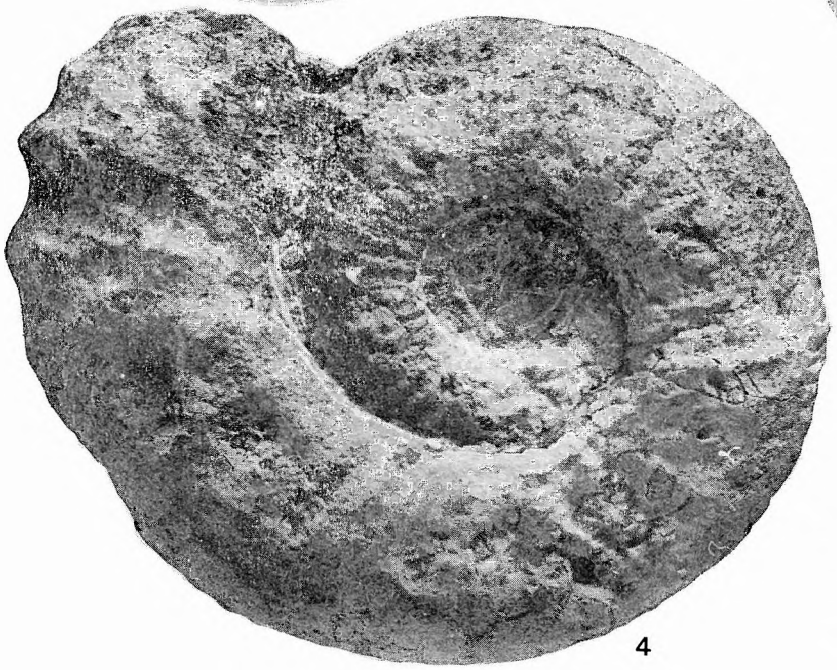


2

3a



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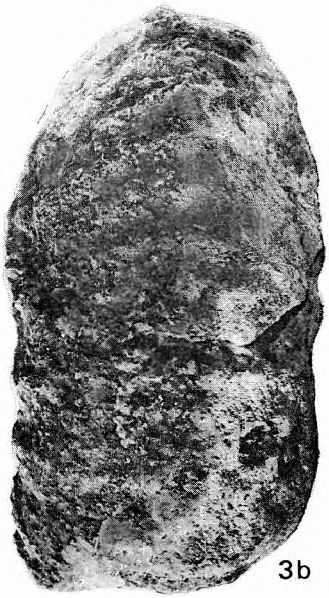


3b

PLATE XIX

Fig. 1. *Tulites (Rugiferites) serpenticonus* (ARKELL), Profile VI, Bed 4, Subcontractus Zone (J9315)

Fig. 2. *Orthogarantiana* cf. *bifurcata* (ZIETEN), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9372)

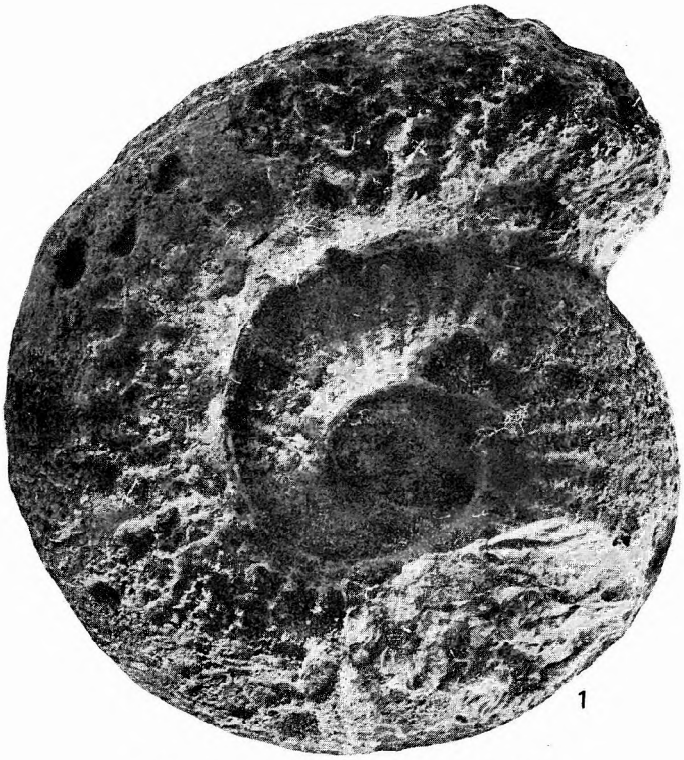
Figs. 3a—b. *Garantiana (Garantiana) baculata* (QUENSTEDT), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9379)

Figs. 4a—b. *Orthogarantiana* cf. *bifurcata* (ZIETEN), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9371)

Figs. 5a—b. *Garantiana (Garantiana) protracta* (BENTZ), Profile VI, Bed 17, Subfurcatum Zone (J9380)

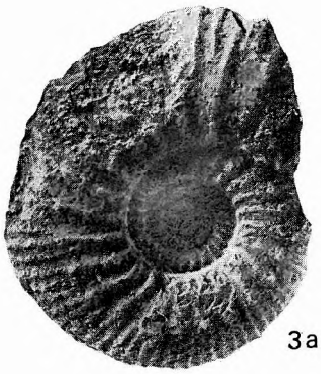
Fig. 6. *Garantiana (Hlawiceras) subangulata* WETZEL, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9381)

All photos natural size



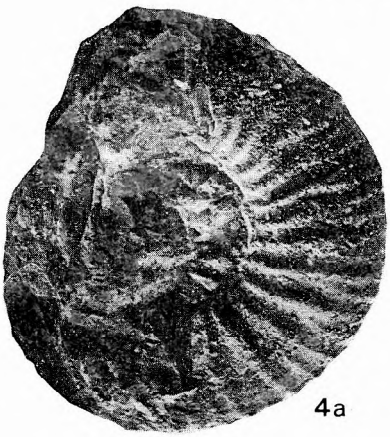
1

2

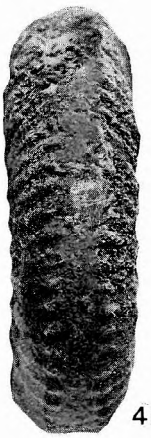


3a

3b



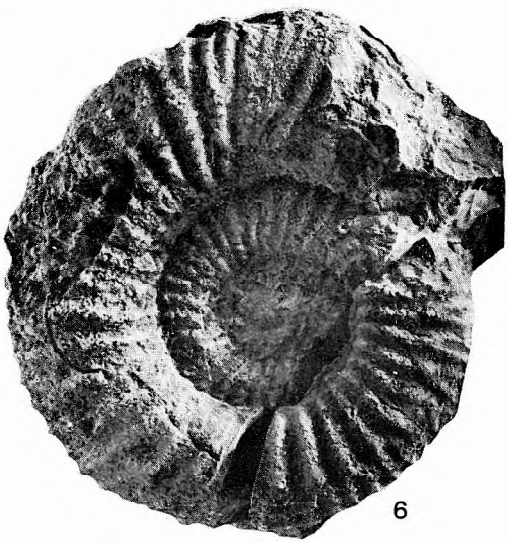
4a



4b

5a

5b



6

PLATE XX

Figs. 1a—b. *Garantiana (Hlawiceras) alticosta* WETZEL, Profile VI, Bed 15, Parkinsoni Zone (J9382)

Fig. 2. *Caumontisphinctes polygyralis* BUCKMAN, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9384)

Fig. 3. *Caumontisphinctes polygyralis* BUCKMAN, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9383)

Fig. 4. *Parkinsonia (Parkinsonia) rarecostata* (BUCKMAN), Profile VI, Bed 15, Parkinsoni Zone (J9387)

Figs. 5a—b. *Parkinsonia (Parkinsonia) parkinsoni* (SOWERBY), Profile I, Parkinsoni Zone (J9385)

All photos natural size

1a

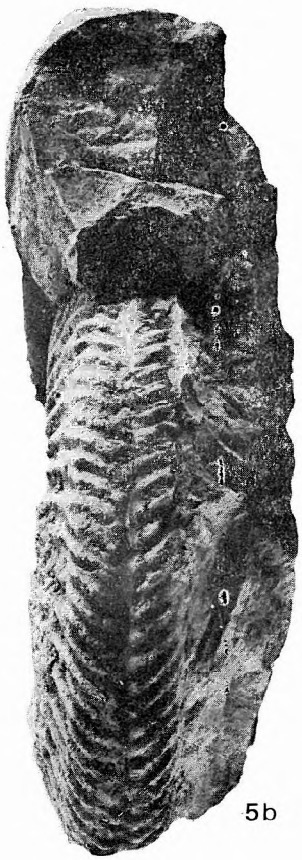
1b

2

3

4

5a



5b

PLATE XXI

Fig. 1. *Parkinsonia (Parkinsonia)* sp. Profile VI, Bed 15, Parkinsoni Zone (J9388)

Fig. 2. *Spiroceras baculatum* (QUENSTEDT), apertural fragment. Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9393)

Fig. 3. *Spiroceras baculatum* (QUENSTEDT), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9392)

Figs. 4a—b. *Spiroceras bifurcati* (QUENSTEDT), Profile VI, Bed 17, Subfurcatum Zone (J9390)

Fig. 5. *Parkinsonia (Parkinsonia)* cf. *subtilis* ARKELL, Profile VI, Bed 9, Zigzag Zone (J9389)

All photos natural size

1

2

3

4a

4b

5

PLATE XXII

Fig. 1. *Spiroceras orbignyi* (BAUGIER et SAUZÉ), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9394)

Figs. 2a—b. *Spiroceras orbignyi* (BAUGIER et SAUZÉ), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9396)

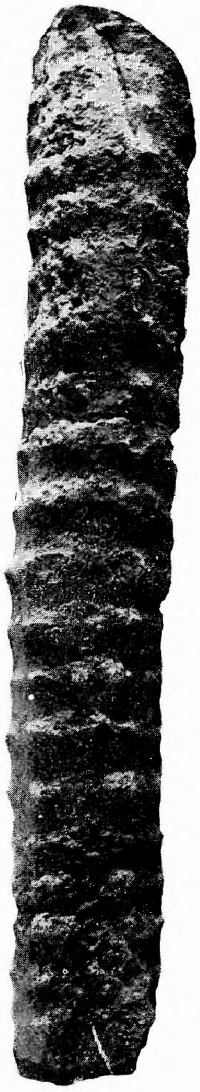
Fig. 3. *Dimorphinites* (unnamed subg.) *defrancii* (D'ORBIGNY), Profile VI, Bed 15, Parkinsoni Zone (J9370)

Figs. 4a—b. *Parapatoceras* sp. a = ventral view, b = lateral view. Profile VI, Bed 10, Zigzag Zone (J9397)

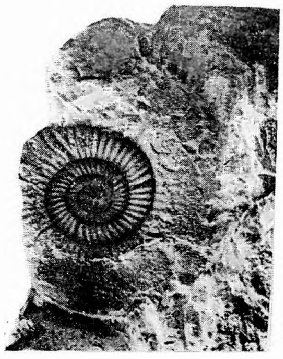
All photos natural size

1

2a



2b



3

4a

4b

PLATE XXIII

Figs. 1a—b. *Dimorphinites (Dimorphinites) dimorphus* (D'ORBIGNY), Profile VI, Bed 13, Parkinsoni Zone (J9362)

Figs. 2a—c. *Dimorphinites (Dimorphinites) dimorphus* (D'ORBIGNY), Profile VI Bed 13, Parkinsoni Zone (J9361)

Fig. 3. *Dimorphinites (Dimorphinites) dimorphus* (D'ORBIGNY), Profile VI, Bed 14, Parkinsoni Zone (J9360)

Figs. 4a—b. *Dimorphinites (Dimorphinites) compressus* n. sp. Holotype, Profile VI, Bed 13, Parkinson Zone (J9366)

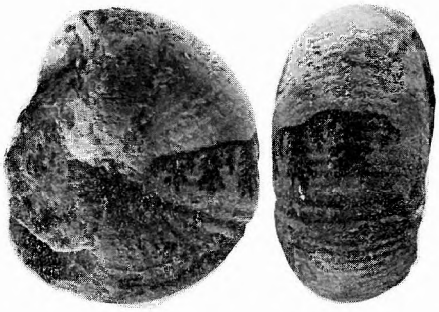
Fig. 5. *Dimorphinites (Dimorphinites) dimorphus* (D'ORBIGNY), Profile VI, Bed 13, Parkinsoni Zone (J9363)

Fig. 6. *Dimorphinites (Dimorphinites) compressus* n. sp. Profile VI, Bed 13, Parkinsoni Zone (J9365)

Figs. 7a—b. *Leptosphinctes (Cleistosphinctes) cleistus* BUCKMAN, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9401)

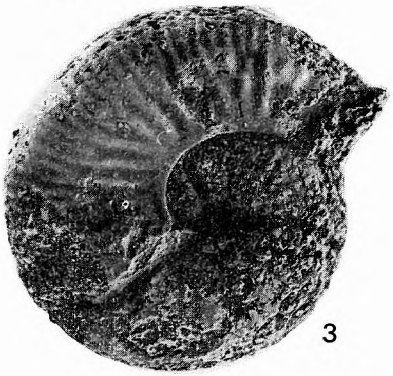
Fig. 8. *Leptosphinctes (Cleistosphinctes) cleistus* BUCKMAN, Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9402)

All photos natural size



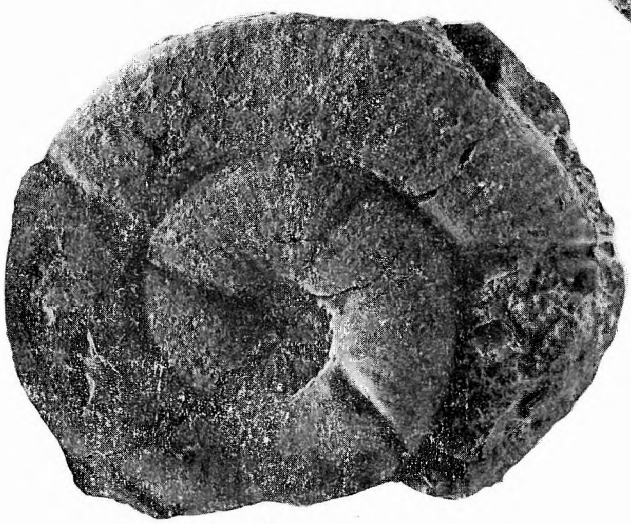
1a 1b

2a 2b 2c



3

4a 4b



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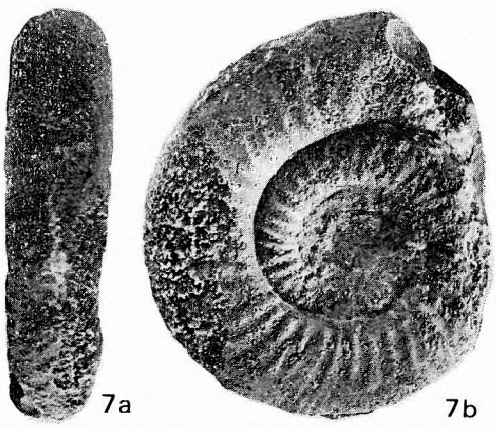
6



7a 7b

8

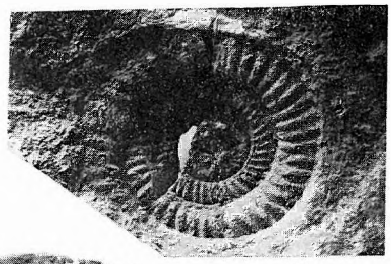
PLATE XXIV

Fig. 1. *Leptosphinctes (Leptosphinctes) davidsoni* (BUCKMAN), inner whorls. Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9399)

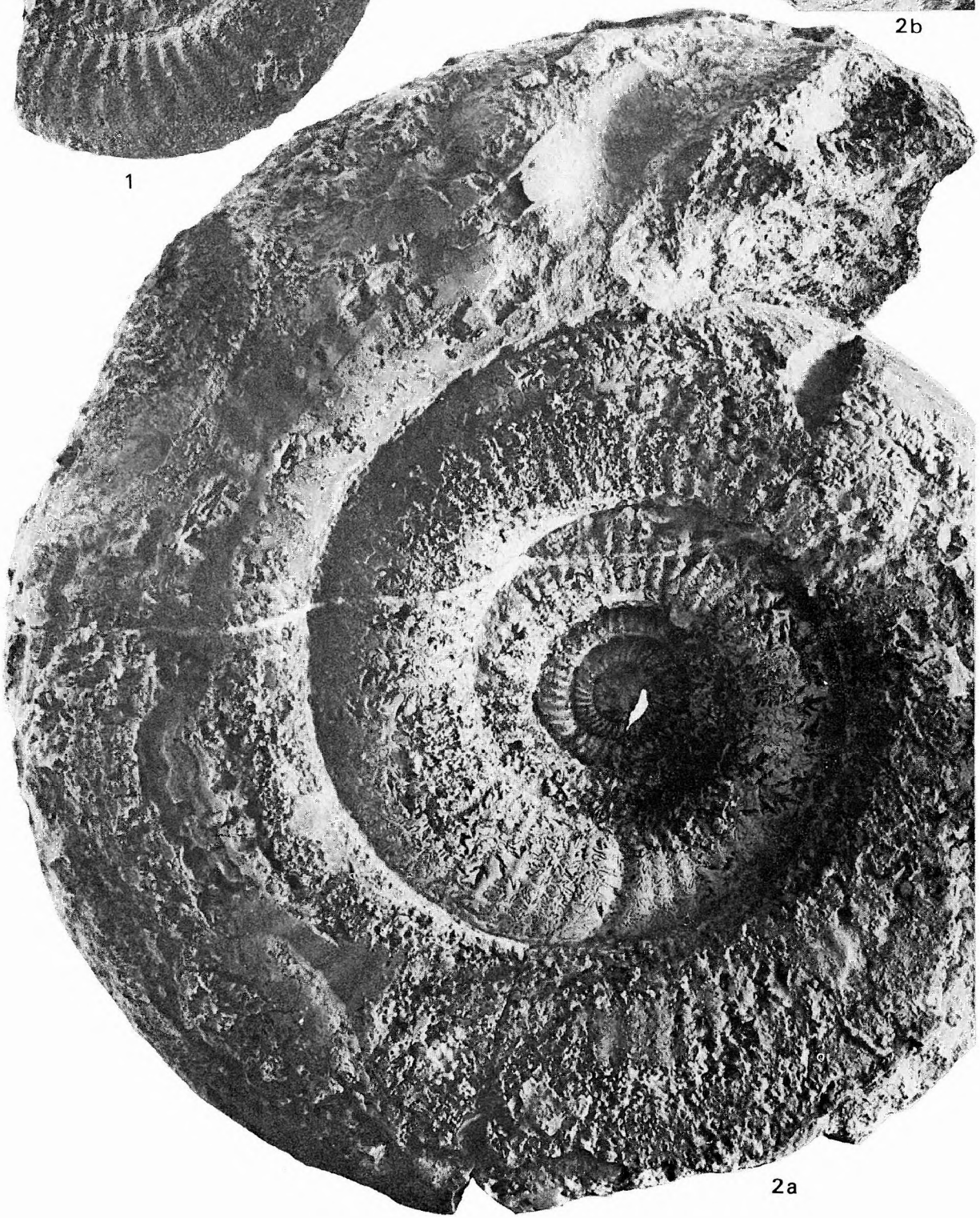
Figs. 2a—b. *Leptosphinctes (Leptosphinctes) davidsoni* (BUCKMAN), b = inner whorls of the specimen as exposed on left side. Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9398)

All photos natural size

1



2b



2a

PLATE XXV

Fig. 1. *Vermisphinctes (Vermisphinctes) martinsi* (D'ORBIGNY), Profile VI, Bed 15, Parkinsoni Zone (J9404)

Fig. 2. *Vermisphinctes (Prorsisphinctes) stomphus* (BUCKMAN), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9405)

Figs. 3a—b. *Vermisphinctes (Prorsisphinctes) hoffmanni* (GEMMELLARO), Profile VI, Bed 15, Parkinsoni Zone (J9412)

Fig. 4. *Bigotites (Bigotites) bajociensis* (SIEMIRADZKI), Profile VI, Bed 15, Parkinsoni Zone (J9422)

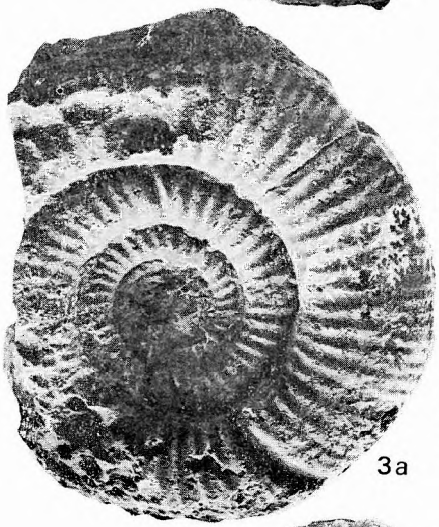
Figs. 5a—b. *Vermisphinctes (Prorsisphinctes) venetus* STURANI, Profile VI, Bed 13, Parkinsoni Zone (J9411)

Fig. 6. *Bigotites (Bigotites) curvatus* (BUCKMAN), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9414)

All photos natural size

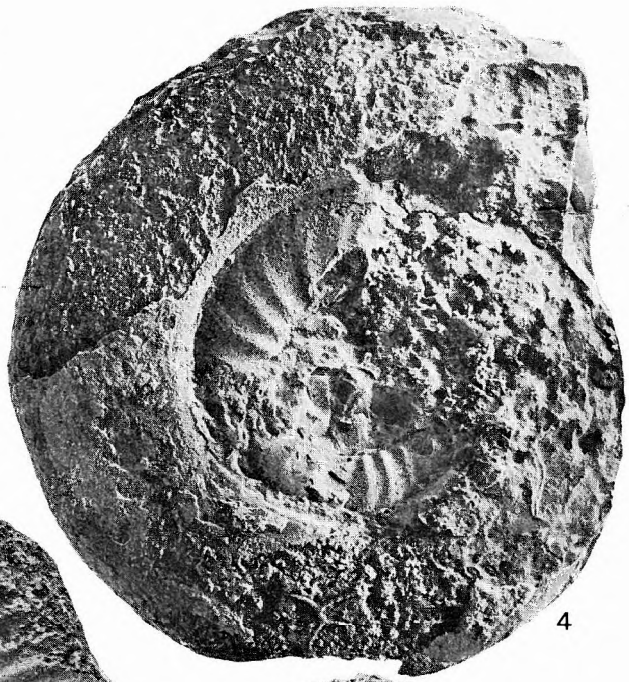
1

2



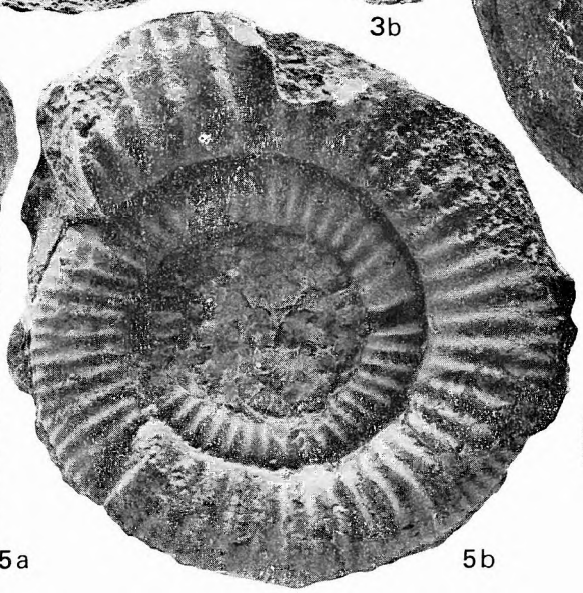
3a

3b



4

5a



5b

6

PLATE XXVI

Fig. 1. *Vermisphinctes (Prorsisphinctes) stomphus* (BUCKMAN), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9405)

Fig. 2. *Bigotites (Bigotites) hodicus* (NIKANOROVA), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9417)

Figs. 3a—b. *Bigotites (Bigotites) lanquinei* (NICOLESCO), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9421)

All photos natural size


1
2
3a
3b

PLATE XXVII

Vermisphinctes (Prorsisphinctes) pseudofrequens (Siemiradzki), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9408)

Natural size

PLATE XXVIII

Fig. 1. *Vermisphinctes (Prorsisphinctes)* cf. *limnioticus* (BUCKMAN), Profile VI, Bed 13, Parkinsoni Zone (J9410)

Figs. 2a—c. *Vermisphinctes (Prorsisphinctes) leederi* (TRAUTH), Profile VI, Bed 15, Parkinsoni Zone (J9400)

All photos natural size

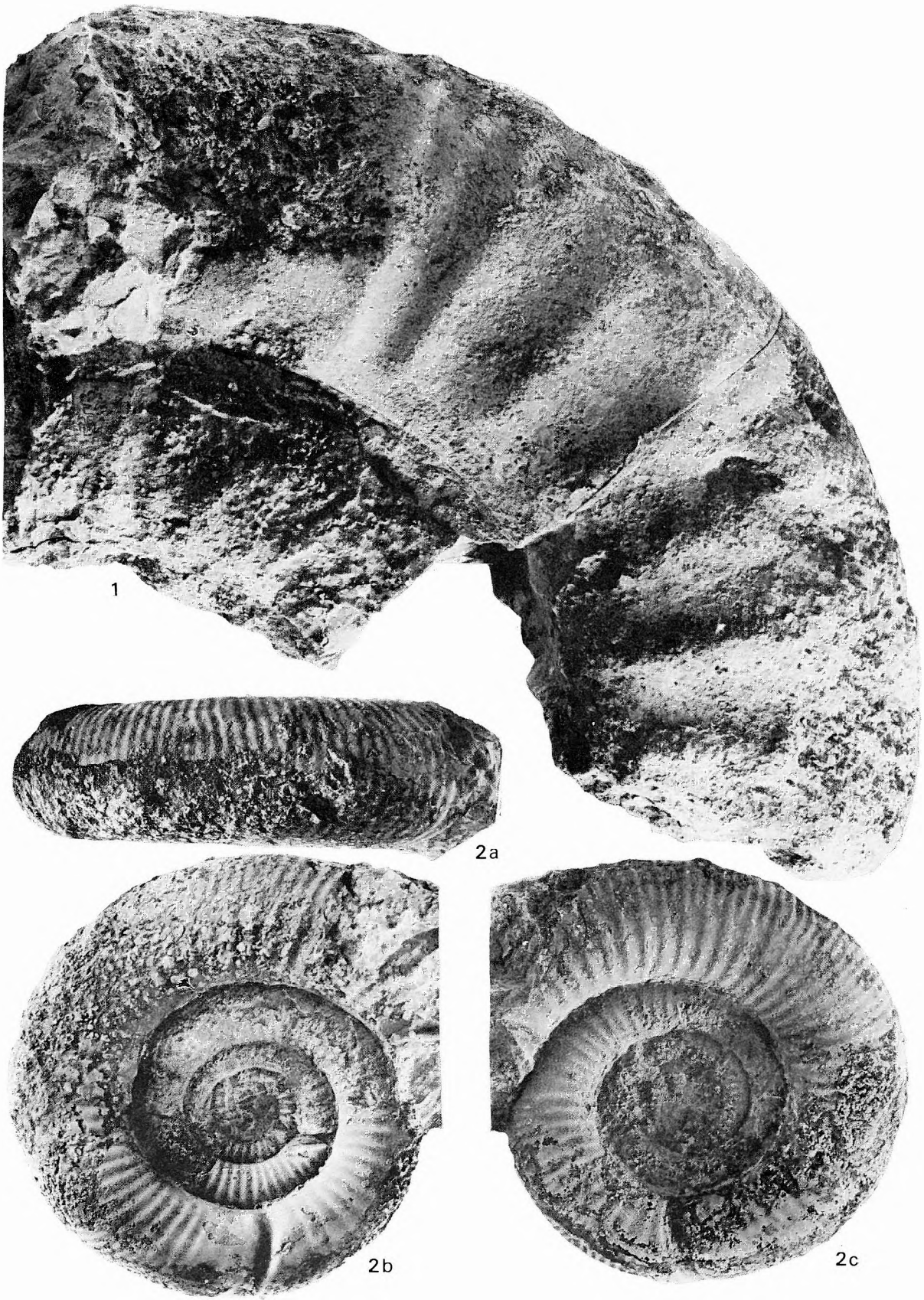

1
2a
2b
2c

PLATE XXIX

Fig. 1. *Vermisphinctes (Prorsisphinctes)* sp. Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9409)
2/3 natural size

Fig. 2. *Bigotites (Bigotites) tuberculatus* (NICOLESCO), Profile VI, Bed 16, Subfurcatum and Garantiana Zones (J9416)
Natural size

Fig. 3. *?Zigzagiceras (?Zigzagiceras)* sp. indet. Profile VI, Bed 10, Zigzag Zone (J9425)

Natural size

1

2

3

PLATE XXX

Procerites cf. *hodsoni* ARKELL, Profile VI, Bed 1, Retrocostatum Zone (J9426)

Natural size

PLATE XXXI

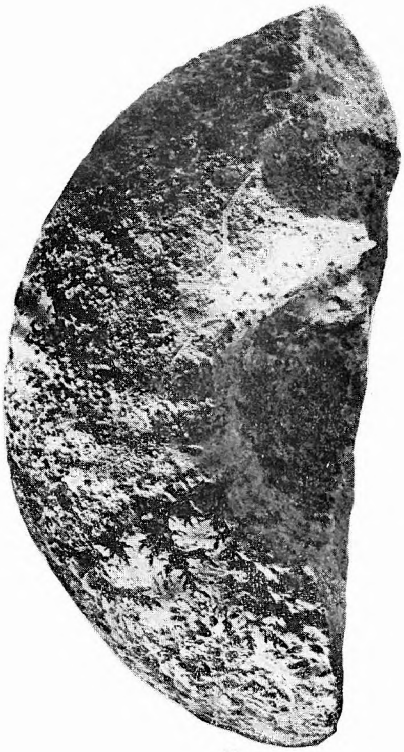
Fig. 1. *Procerites* cf. *clausiprocerus* (BUCKMAN), Profile VI, Bed 10, Zigzag Zone (J9427)

Figs. 2a—b. *Zigzagiceras (Procerozigzag) pseudoprocerum* (BUCKMAN), Profile VI, Bed 10, Zigzag Zone (J9423)

Fig. 3. *Wagnericeras (Wagnericeras) subfurcula* (LISSAJOUS), Profile VI, Bed 7, Subcontractus Zone (J9428)

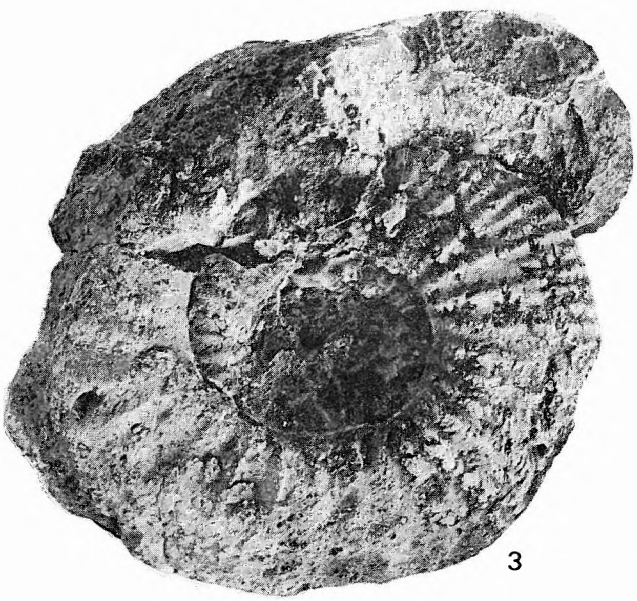
All photos natural size

1



2a

2b



3

PLATE XXXII

Zigzagiceras (Procerozigzag) postpollubrum WETZEL, Profile VI, Bed 9, Zigzag Zone (J9424)

Natural size

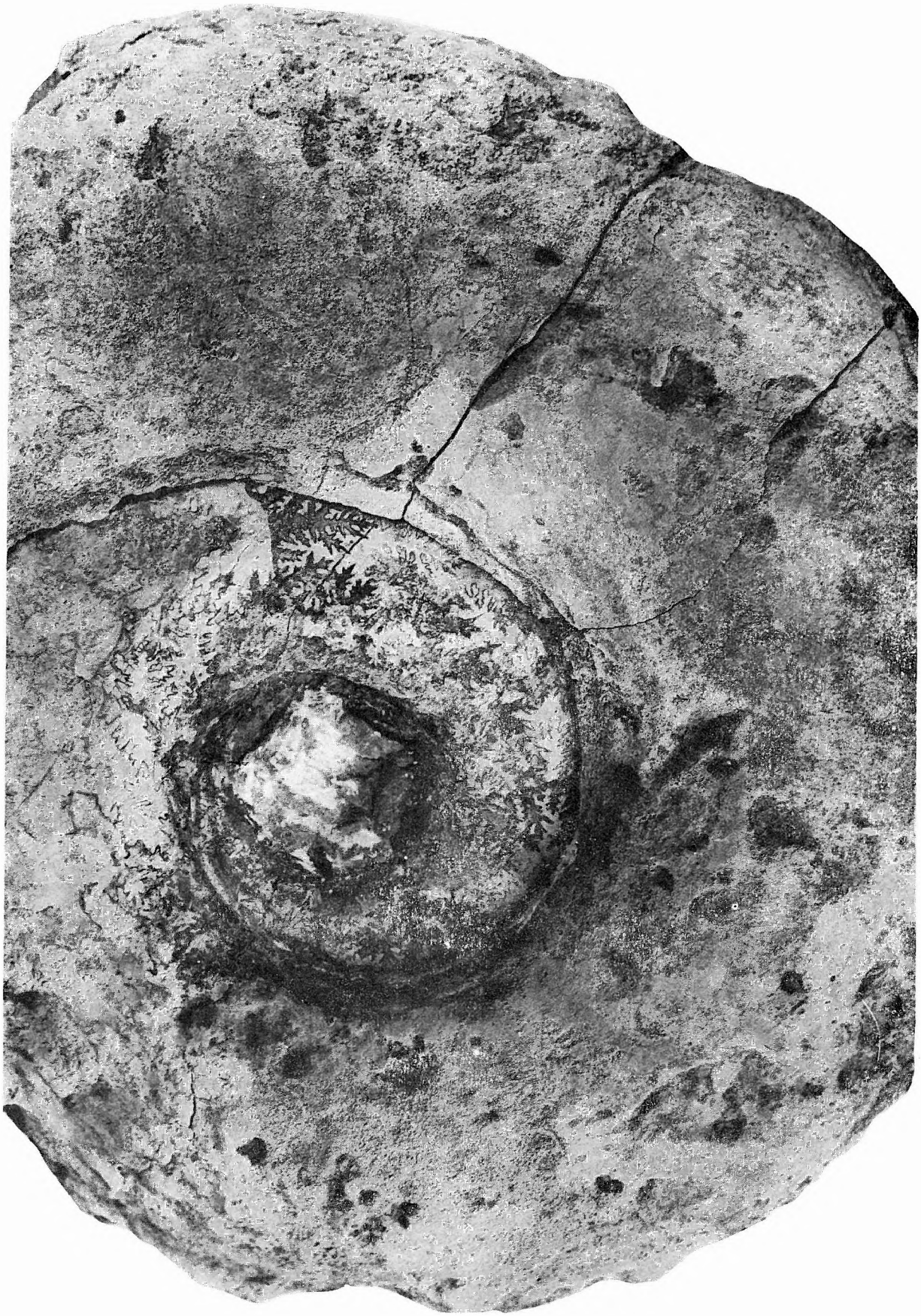


PLATE XXXIII

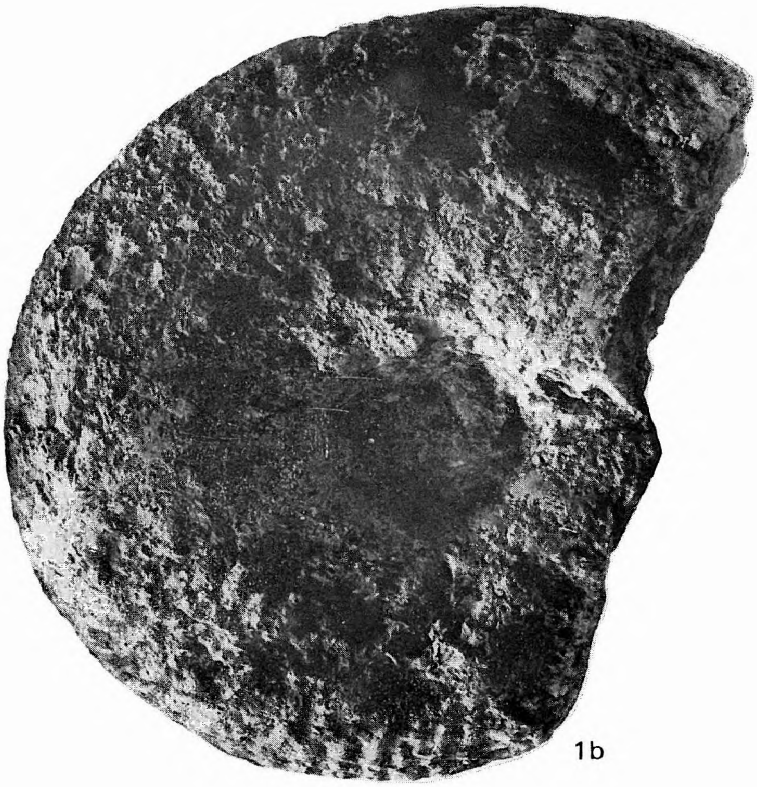
Figs. 1a—b. *Wagnericeras (Suspensites) suspensum* BUCKMAN, Profile VI, Bed 8, Progracilis Zone (J9429)

Fig. 2. *Choffatia (Homoeoplanulites)* sp. indet. Profile VI, Bed 4, Subcontractus Zone (J9440)

Fig. 3. *Wagnericeras (Suspensites)* sp. aff. *arbustigerum* (D'ORBIGNY), Profile VI, Bed 1, Retrocostatum Zone (J9431)

All photos natural size

1a



1b

2

3

PLATE XXXIV

Fig. 1. *Choffatia (Choffatia) subbakeriae* (D'ORBIGNY), Profile VI, Bed 1, Retrocostatum Zone (J9435)

Fig. 2. *Choffatia (Subgrossouvria)* cf. *uriniacensis* (LISSAJOUS), Profile II, Bed 3, Subcontractus Zone (J9437)

Fig. 3. *Choffatia (Subgrossouvria) uriniacensis* (LISSAJOUS), Profile VI, Bed 7, Subcontractus Zone (J9436)

All photos natural size

1

2

3

PLATE XXXV

Choffatia (Choffatia) densidecorata n. sp. Holotype, Profile VI, Bed 1, Retrocostatum Zone (J9432)

Natural size

PLATE XXXVI

Fig. 1. *Choffatia (Subgrossouvria) cercalis* ARKELL, Profile II, Bed 1, Retrocostatum Zone (J9438)

Fig. 2. *Choffatia (Subgrossouvria)* cf. *rakotondramazavai* (COLLIGNON), Profile II, Bed 4, Subcontractus Zone (J9439)

All photos natural size

1

2