

Late Albian (*Stoliczkaia dispar* Zone) Ammonites from Misburg, Hannover

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Lytoceratina (Turrilitaceae, Scaphitaceae, Desmocerataceae, Hoplitaceae, Acanthocerataceae),
Albian, mudstone facies, basinal sediments

North German Hills (Misburg), Lower Saxony

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A b s t r a c t : A section in the mudstone facies of the Upper Albian sediments in north Germany was exposed by collectors on the Mittelland-Kanal at Misburg, Hannover. It has yielded a small macrofauna of early *Mortoniceras* (*Durnovarites*) *perinflatum* Subzone age (*Stoliczkaia dispar* Zone) which is described here. The horizon corresponds to part of the broad foraminiferal zone 8 of PRICE (1977) recorded in test borings 250—254 for the Hannover underground railway system. Although the Misburg faunule is crushed and imperfectly preserved, it is the first discovery of ammonites in the upper part of the Upper Albian in the basinal facies. The ammonites permit a direct correlation to be made between these basinal sediments and the sequence in the upper part of the more marginal Flammenelegel facies in the Harz region to the south and south east.

[Ammoniten aus dem Ober-Alb (*Stoliczkaia dispar*-Zone) von Misburg bei Hannover]

K u r z f a s s u n g : Am Mittelland-Kanal in Misburg, Hannover, wurde ein Profil in der tonigen Fazies des Ober-Alb in Norddeutschland von Sammlern freigelegt. Dabei wurde eine Makrofauna aus der frühen *Mortoniceras* (*Durnovarites*) *perinflatum* Unterzone (*Stoliczkaia dispar* Zone) gefunden, die hier beschrieben wird. Die Fundschichten entsprechen einem Teil der umfassenden Foraminiferenzzone 8 von PRICE (1977), die in den Vorbohrungen 250—254 für die hannoversche Untergrundbahn nachgewiesen wurden. Obwohl die Misburger Fauna verdrückt und schlecht konserviert ist, lieferte sie die ersten Funde von Ammoniten aus dem oberen Teil des Ober-Alb in der Beckenfazies. Die Ammoniten erlauben eine direkte Korrelation zwischen diesen Beckensedimenten und dem oberen Teil der randlicheren Flammenmergelfazies in der Harzregion im Süden und Südosten.

[Аммониты верхнего альба (зона *Stoliczkaia dispar*) в Мисбурге близ Ганновера]

Резюме: На Средне-Германском канале в Мисбурге близ Ганновера был обнажен разрез в тонштейновой фации осадочных пород Северогерманского верхнего альба. При этом найдена маленькая макрофауна из нижней подзоны *Mortoniceras (Durnovarites) perinflatum* (зона *Stoliczkaia dispar*), которая описана в данной работе. Слои, в которых сделаны находки, отвечают участку широкой фораминиферовой зоны 8 по PRICE (1977), обнаруженной в скважинах, пройденных с целью составления экспертизы по свойствам грунта Ганноверского метро (скважины 250—254). Хотя Мисбургская фауна была деформирована и показала плохую сохранность, она дала первые аммонитовые находки из верхней части верхнего альба в бассейновой фации. Аммониты позволяют вести прямую корреляцию между этими бассейновыми осадками и верхней частью находящейся ближе ко краю фации пламенного мергеля в районе Гарца на юго-востоке Нижнесаксонского бассейна.

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1. Introduction

Ammonites of *Stoliczkaia dispar* Zone age are known from the upper part of the *F l a m m e n m e r g e l* in the Salzgitter region and at other localities fringing the northern margin of middle European land mass (JORDAN & SCHMID 1968, JORDAN 1982, OWEN 1979, SCHOLZ 1979b, FRIEG, KEMPER & OWEN this volume). Until the discovery of the faunule in the Mittelland-Kanal section at Misburg, however, no ammonites had been recorded from the light grey mudstones of the deeper water basinal facies, known from foraminiferal evidence to span the whole of the *dispar* Zone (PRICE 1977a, b, FRIEG & KEMPER this volume). Although not well preserved, this faunule is of sufficient importance to describe and illustrate and indicates a more precise age for the sediments, within the early part of the *Mortoniceras (Durnovarites) perinflatum* Subzone. The opportunity is taken to revise some of the taxonomic determinations of SCHOLZ (1979b) of the penecontemporaneous ammonite fauna described from the upper part of the *F l a m m e n m e r g e l* of the Salzgitter region.

The following list of ammonites includes all the specimens obtained from the Mittelland-Kanal section situated on its west bank approximately 250 m south of the junction with the Misburg Stichkanal in Hannover-Misburg (re 35 57 300, h 58 05 660).

- cf. *Lechites communis* SPATH
Idihamites elegantulus elegantulus SPATH
Idihamites elegantulus laticostatus RENZ
Idihamites cf. *dorsetensis* SPATH
 cf. *Ostlingoceras* sp.
Scaphites simplex (JUKES-BROWNE)
 cf. *Worthoceras* sp.
Puzosia (*Puzosia*) *mayoriana* (D'ORBIGNY)
Callihoplites cf. *leptus* (SEELEY)
Callihoplites cf. *cratus* (SEELEY)
Anahoplites (*Leptihoplites*) *falcoides* SPATH
Anahoplites (*Leptihoplites*) *pseudoplanus* SPATH
Anahoplites (*Leptihoplites*) *proximus* SPATH
Anahoplites (*Leptihoplites*) cf. *ornatus* SPATH
 cf. *Stoliczkaia* (*Stoliczkaia*) *notha* (SEELEY)

All specimens are crushed flat in pale-grey marl, some with remnants of the shell preserved. The material is preserved in the collections of the Bundesanstalt für Geowissenschaften und Rohstoffe/Niedersächsisches Landesamt für Bodenforschung, Hannover. The specimen registration numbers used in the text are an arbitrary series for the MEYER & SCHMIDTKE collection, devised by the writer.

A c k n o w l e d g e m e n t s : My thanks are due to Dr. EDWIN KEMPER and Dr. FRIEDRICH SCHMID for the opportunity to describe this material collected by DIRK MEYER and KLAUS SCHMIDTKE. The photographs of the specimens were taken by H. AXMANN and PHIL HURST.

2. Systematic Descriptions

- Order Ammonoidea ZITTEL 1884
 Suborder Lytoceratina HYATT 1889
 Superfamily Turrilitaceae MEEK 1876
 Family Baculitidae MEEK 1876
 Genus *Lechites* NOWAK 1908
 cf. *Lechites communis* SPATH

Plate 1, Fig. 1

cf. 1941 *Lechites communis* SPATH, 666—7, text fig. 244.

M a t e r i a l. 1 specimen (MF2) with traces of septal suturing figured here and 3 very doubtful specimens (MF 27, MF 28 & MF 29).

D i s c u s s i o n. The specimens are portions of tapering straight shafts; the shells, which consist mainly of body chambers, being crushed flat. There is evidence of slight constrictions and fine ribbing consistent with the nearly smooth variety of *L. communis* figures by SPATH (1923—43: 667, text figs. 224, f, g) which is morphologically transitional to the Cenomanian genus *Sciponoceras*. A less crushed fragment of a comparable form was obtained from a cable trench at Bemerode in 1966.

Family Anisoceratidae HYATT 1900

Genus *Idiohamites* SPATH 1925*Idiohamites elegantulus elegantulus* SPATH

Plate 1, Figs. 2—5.

1939 *Idiohamites elegantulus* SPATH, 599—600, text fig. 216.

M a t e r i a l. The nominate subspecies of *I. elegantulus* is well represented in the collection by seven individuals (MF6, 9, 11, 12, 14, 16 and 33) all of them crushed laterally.

D i s c u s s i o n. Although crushed, these specimens show the typical loose coiling pattern with slowly expanding whorl section, the relatively delicate shells and fine ribbing pattern characteristic of *I. elegantulus elegantulus* SPATH.

Since the original description of the nominate subspecies, other specimens have been collected in England which show the irregular nature of the occurrence of the ribs which bear the ventro-lateral tubercles. The tuberculate ribs may have up to three untuberculate ribs separating them. The specimens from the F l a m m e n m e r g e l of the Hillenberg figured by SCHOLZ as *Anisoceras (Idiohamites) elegantulus* (1979b, Taf. 2, figs. 5—10; Taf. 3, fig. 5) do not belong to the present species. The coiling pattern is distinctly hamitid and the ribbing much coarser and more uniformly tuberculate than in the true *I. elegantulus*.

Idiohamites elegantulus laticostatus RENZ

Plate 1, Fig. 6

1968 *Idiohamites elegantulus laticostatus* RENZ, 73—4, Taf. 11, figs. 38a—c, 41a—c, 42a, b; Taf. 12, figs. 1a—c, 2a—c, text figs. 25m, 26i-m.

M a t e r i a l. A single specimen (MF 15a, b counterparts) crushed with traces of the shell.

D i s c u s s i o n. The essential difference between the nominate subspecies *elegantulus* SPATH and *laticostatus* RENZ is the relative coarseness of the ribbing in the latter as the name implies. Both subspecies possess the same loose coiling pattern with slowly expanding whorl section. Although crushed, MF15 shows the rib and ventro-lateral tubercle pattern characteristic of the holotype of *I. elegantulus laticostatus* figured by RENZ (1968, Taf. 12, fig. 1a—c).

Idiohamites dorsetensis SPATH

Plate 1, Figs. 7—8.

1939 *Idiohamites dorsetensis* SPATH, 596—9, Pl. LXII, figs. 2, 3; Pl. LXIII, figs. 1, 9, 15; Pl. LXV, fig. 2; text fig. 215.

1968 *Idiohamites dorsetensis* SPATH; RENZ 70—71, Taf. 11, figs. 39a—c, 40a—c; Taf. 12, fig. 3a—c, 4a—c, text fig. 25a—d, f, 26a, b.

M a t e r i a l. One adult specimen (MF10) and one juvenile (MF32), both crushed flat, are present in the collection and which can be referred to *I. dorsetensis* with some confidence. There are also five specimens showing the coiled juvenile stage which failed to mature in life and which are only doubtfully assigned to this species (MF 5, 8, 30, 31, 34) one of which (MF8) is figured in Plate 1, Fig. 8.

Family Turrititidae MEEK 1876
Genus *Ostlingoceras* HYATT 1900
Ostlingoceras sp. ind.
Plate 1, Figs. 9a, b.

M a t e r i a l. One poorly preserved juvenile (MF7) crushed flat and preserved in part and counterpart.

D e s c r i p t i o n. Although poorly preserved, the specimen shows the simple straight ribbing terminating in two basal rows of tubercles on the whorls of this tightly coiled and high-spined turricone. Traces of the septal suturing is to be seen on the steinkern.

D i s c u s s i o n. The specimen is sufficiently preserved to show that it belongs to the genus *Ostlingoceras*, but is too small to assign it to a species. The genus ranges in age from the late Albian *dispar* Zone into the early Cenomanian.

Superfamily Scaphitaceae MEEK 1876
Family Scaphitidae MEEK 1876
Subfamily Scaphitinae MEEK 1876
Genus *Scaphites* PARKINSON 1811

D i s c u s s i o n. The genus '*Eoscaphtes*' BREISTROFFER 1947 (type species, *Ammonites? circularis* J. DE C. SOWERBY) was based on a species which occurs in the *Hysterocheras varicosum* Subzone. Two related species are known from this Subzone; the more loosely coiled *Scaphites circularis* (J. DE C. SOWERBY), and the more involute *Scaphites subcircularis* SPATH. The latter species continues into the succeeding Subzone of *Callihoplites auritus* and is the immediate forerunner of *Scaphites simplex* JUKES-BROWNE of *dispar* Zone age.

Scaphites simplex shows an ornament pattern which varies between the simple branched, untuberculated ribbing of '*Eoscaphtes*' (e. g. *S. subcircularis*) to the tuberculate pattern of the typical *Scaphites* [e. g. *S. hugardianus* (D'ORBIGNY)]. Indeed, there is a simple evolutionary series present, shown in the nature of shell coiling and the ornament, from the evolute form with simple untuberculated-ribs, *S. circularis* of the *varicosum* Subzone, to the tightly coiled and hooked form with branched tuberculated ribs typified by the type species of *Scaphites*, *S. equalis* (J. SOWERBY), of Cenomanian age. It is not necessary to separate the early forms as '*Eoscaphtes*' even at subgeneric level and it is advocated here that BREISTROFFER's generic name be treated as a subjective synonym

of *Scaphites* PARKINSON. This opinion differs from that of WIEDMANN who retained *Eoscaphtes* for the earlier group while recognizing the transitional nature of *S. simplex* (WIEDMANN 1965).

Scaphites simplex JUKES-BROWNE

Plate 1, Figs. 10—11

1937 *Scaphites simplex* JUKES-BROWN, SPATH 504—7, Pl. LVII, figs. 13—23, text figs. 176c—f, 177a—e (with synonymy).

1965 *Scaphites simplex* JUKES-BROWNE, WIEDMANN 412—5, Pl. 54, figs. 1, 7; Pl. 55, figs. 4, 5, text fig. 3e.

1968 *Scaphites simplex* JUKES-BROWNE, RENZ, 93.

M a t e r i a l. Twelve individuals are present on five pieces of clay (MF 3, 4, 37, 38, 39), all crushed.

D i s c u s s i o n. Although crushed, the specimens are well enough preserved to permit identification at species level. SPATH (1937) recognised two additional subspecies *S. simplex nodata* and *S. simplex sublaevis*. The former is merely a transition to *Scaphites hugardianus* (D'ORBIGNY), the latter possibly an early form of *Scaphites tenuicostatus* PERVINQUIÈRE from the Cenomanian of Algeria. All the Misburg specimens show the simple branched rib pattern stemming from stout single ribs on the lower whorl flank, nodes being absent, which is characteristic of the typical *Scaphites simplex* JUKES-BROWNE.

'Subfamily Otoscaphitinae WRIGHT 1953'

Genus *Worthoceras* ADKINS 1928

WIEDMANN (1965) placed the genus *Worthoceras* in the Ptychoceratidae considering *Otoscaphtes*, its supposed descendant, to be a member of the Scaphitidae. The problem of the systematic position of *Worthoceras* is still not resolved but in the writer's opinion it does not belong in the Ptychoceratidae.

cf. *Worthoceras* sp. ind.

Plate 1, Figs. 12a, b.

M a t e r i a l. A single crushed specimen, the shell having been dissolved away during sediment diagenesis (MF1).

D i s c u s s i o n. The specimen shows the typical coiled early whorls and hooked adult whorl of a species of *Worthoceras*, but no septal sutural pattern is preserved. It can only be referred to this genus with doubt therefore.

Superfamily Desmocerataceae ZITTEL 1895

Family Desmoceratidae ZITTEL 1895

Subfamily Puzosiinae SPATH 1922

Genus *Puzosia* BAYLE 1878

Subgenus *Puzosia* sensu stricto

Puzosia (Puzosia) mayoriana (D'ORBIGNY)

Plate 1, Fig. 13

1984 *Puzosia (Puzosia) mayoriana* (D'ORBIGNY) WRIGHT & KENNEDY, 55—58, text figs. 1 A, B; 2 C, H, M; 3 N-R; 4 A—E, Pl. 3, figs. 1, 2, 4, 6, 9—12; Pl. 4, figs. 1, 2, 5—7. With synonymy.

M a t e r i a l. A single crushed specimen (MF 17) with traces of the shell.

D i s c u s s i o n. A good description of this species is given by WRIGHT & KENNEDY (1984). *P. (P.) mayoriana* is of widespread occurrence in deposits of Upper Albian age in the European province from the *Callihoplites auritus* Subzone onward. It extends into the Cenomanian and is locally common in deposits of both Albian and Cenomanian age. The genus has a cosmopolitan distribution. The Misburg specimen, although crushed, is typical of this species in its pattern of constrictions and ribbing.

Superfamily Hoplitaceae DOUVILLÉ 1890

Family Hoplitidae DOUVILLÉ 1890

Subfamily Hoplitinae DOUVILLÉ 1890

Genus *Callihoplites* SPATH 1925

D i s c u s s i o n. SCHOLZ (1979 b) relegated the genus *Callihoplites* (Type species *Ammonites catillus* J. DE C. SOWERBY) to the rank of a subgenus of *Pleurohoplites* SPATH 1921 (Type species *Ammonites renauxianus* D'ORBIGNY) along with *Lepthoplites* discussed below, and *Arrhaphoceras* WHITEHOUSE (SPATH 1927). In effect, this was a return to SPATH's original concept of *Pleurohoplites* before he had studied fully the interrelationships of this group of ammonites. The stratigraphical distribution of these taxa is now much better understood as a result of more recent studies of the ammonite subzonal sequence (e. g. OWEN 1976, 1979, 1985). *Pleurohoplites* is restricted to the *perinflatum* Subzone. At the end of the Albian, species of *Callihoplites* and *Lepthoplites* are characterised by raised siphonal regions on the venter foreshadowing the keel of their Cenomanian successor, *Schloenbachia*.

There is no evidence that *Callihoplites* and *Lepthoplites* are directly related. *Callihoplites* is derived from *Epihoplites* (e. g. *E. gibbosus* SPATH) and, possibly, from late forms of *Semenovites* (e. g. *S. gracilis* SPATH) by convergence, at the end of the *varicosum* Subzone. In both instances, these early individuals of *Callihoplites* have the simple-ribbed inner whorls of their progenitors and the lautiform-ribbed outer whorls of *Callihoplites*. In the *perinflatum* Subzone, *Callihoplites* produced transitions to the nonlautiform ribbed species of *Arrhaphoceras*. However, the typical form of *Arrhaphoceras*, *A. studeri* (PICTET & CAMPICHE) with its simple bifurcating non-lautiform ribbing

distinct from that of contemporary species of *Calliboplites*, supports the retention of this taxon at generic rank. *Ammonites woodwardi* SEELEY, the type species of *Arrhaphoceras* WHITEHOUSE 1927, is considered here to be a malformation of an immature stage of *A. studeri*. The progenitor of *Lepthoplites* is discussed below.

Calliboplites cf. *leptus* (SEELEY)

Plate 2, Fig. 1.

cf. 1929 *Calliboplites leptus* (SEELEY) SPATH, 225—7, Pl. XXIII, figs. 1, 3, 6a, b; text figs. 69e, 73a—c. With synonymy.

M a t e r i a l. A single external cast (MF 13) with traces of the shell, laterally-crushed.

D i s c u s s i o n. Although crushed, the ornamentation of ribs and ventro-lateral clavi shown by the Misburg specimen is closely comparable to that of the holotype of *Calliboplites leptus* (SEELEY) refigured by SPATH (1929, text fig. 73).

Calliboplites cf. *cratus* (SEELEY)

Plate 2, Fig. 2

cf. 1929 *Calliboplites cratus* (SEELEY) SPATH, 222—3, Pl. XXI, figs. 6a, b, text-fig. 71a—c. With synonymy.

M a t e r i a l. An imperfect, obliquely crushed example with traces of shell (MF24) and a more doubtful, laterally crushed, juvenile individual (MF25).

D i s c u s s i o n. The syntype of *Ammonites cratus* SEELEY which most closely approaches the ornament pattern and whorl section of SEELEY's original figure (Sedgwick Museum, Cambridge No. B. 1517) was selected as type by SPATH (1929, text fig. 71C), although this specimen is not the original of SEELEY's illustrations (reproduced by SPATH 1929: 222, text figs. 71a, b). The Misburg specimen (MF 24), although distorted, has the ornament pattern closely similar to that of the lectotype. The juvenile whorls of this rare form show simple bi- or tri-furcating ribs which show no tendency to unite at the ventro-lateral shoulders in the lautiform arrangement. The crushed juvenile specimen from Misburg (MF 25) shows this simple pattern of ribbing.

Genus *Anaboplites* HYATT 1900
Subgenus *Lepthoplites* SPATH 1925

D i s c u s s i o n. SCHOLZ (1979b) relegated *Lepthoplites* to the rank of a subgenus of *Pleurohoplites* SPATH (1921). It is true that SPATH originally included in *Pleurohoplites* forms later separated as *Calliboplites* and *Lepthoplites*. However, these latter genera are now known to have different root stocks. The origin of *Calliboplites* has been discussed above. *Lepthoplites* is morphologically very close to *Anaboplites* and is

regarded here as its direct descendant. Its appearance in the *auritus* Subzone coincides closely with the last appearance of *Anahoplites*, and it continues on into the *perinflatum* Subzone. If *Lepthoplites* is to be regarded as a subgenus, the generic assignation should be *Anahoplites*, not *Pleurohoplites*. *Pleurohoplites* as restricted by SPATH (1925; 1928: 240—8), is a collection of six species and subspecies characterised by relatively simple non-laufiform ribbing and raised venters along the siphonal line. As pointed out already in the discussion of *Callihoplites*, the raised ventral area is characteristic of all hoplitinid ammonites in the later *dispar* Zone foreshadowing the keel of *Schloenbachia* in the early Cenomanian and is of no generic significance.

The type species of *Pleurohoplites*, *P. renauxianus* (D'ORBIGNY) and its subspecies *gracilis* SPATH, together with *P. serpentinus* SPATH which is a compressed form of *P. renauxianus*, represent the only forms which are congeneric. '*P.*' *subvarians* SPATH has the characteristics of a species of *Lepthoplites*, and '*P.*' *epigonus* SPATH is a malformed or degenerate *Callihoplites*. As SPATH (1928: 240) indicated, *P. renauxianus* is somewhat specialised and *Pleurohoplites* is retained here as a separate genus. *Lepthoplites* is regarded here as a direct continuation of the *Anahoplites* root stock but is capable of separation at subgeneric level by the presence of crenulate ventro-lateral edges produced by the node-like ventro-lateral clavi common to all the species included in this subgenus.

Anahoplites (Lepthoplites) falcooides SPATH

Plate 2, Figs. 3—4

1928 *Lepthoplites falcooides* SPATH, 234—5, Pl. XIII, figs. 7 a, b,
Pl. XXIV, fig. 3, text fig. 75 a—c. With synonymy.

1968 *Lepthoplites falcooides* SPATH, RENZ 35, Taf. 4, figs. 9 a, b, 10 a—c,
11 a, b, text fig. 13 a.

M a t e r i a l. Five specimens are present in the collection (MF 20, 21, 40, 43, 45) all crushed laterally.

D i s c u s s i o n. The inner whorls of *A. (L.) falcooides* SPATH are scarcely distinguishable from *Anahoplites (Anahoplites) planus* MANTELL. The only significant difference is in the raised ventral line. The specimens from Misburg, although crushed, show the typical falcooid striae of the outer whorl of the present species.

Anahoplites (Lepthoplites) pseudoplanus SPATH

Plate 2, Figs. 5—7

1928 *Lepthoplites pseudoplanus* SPATH 238—9, Pl. XXIV, figs. 17 a—d,
text fig. 77 a—d.

non 1968 *Lepthoplites pseudoplanus* SPATH, RENZ 36, Taf. 4, figs. 7 a, b,
8 a, b, text fig. 13 c, d.

M a t e r i a l. Four specimens can with confidence be identified with this species (MF 18, 19, 22, 48) and a further two specimens (MF 44, 46) can be referred to it. All the specimens are laterally crushed.

D i s c u s s i o n. *A. (L.) pseudoplanus* possesses an ornament which is transitional in form and strength between the falcoide striae of *A. (L.) falcoides* and the straighter-ribbed *A. (L.) ornatus* SPATH. Although crushed flat, the Misburg specimens fall within the range of ornament variation seen in *A. (L.) pseudoplanus*. The two specimens figured as *L. pseudoplanus* by RENZ (1968) do not belong to that species.

Anahoplites (Lepthoplites) proximus SPATH

Plate 2, Fig. 8

1928 *Lepthoplites proximus* SPATH 237—8, text fig. 76a, b.

M a t e r i a l. Two specimens are present in the Misburg faunule (MF 23, 47) both laterally crushed.

D i s c u s s i o n. The two Misburg specimens show the delicate close, falcoide ribbing pattern of the holotype (BMNH C 32219 — L. F. SPATH coll. No. 918) from the 'Cambridge Greensand' figured by SPATH (1928), together with the pronounced crenulate ventro-lateral clavi. Even when crushed, the finely developed comma-shaped umbilical bullae, present in the Misburg specimens, are sufficient to distinguish this species from *A. (L.) ornatus* SPATH with its strongly pronounced bullae.

Anahoplites (Lepthoplites) cf. ornatus SPATH

Plate 2, Fig. 9

cf. 1928 *Lepthoplites ornatus* SPATH 239—240, text fig. 78a, b.

M a t e r i a l. A single laterally-crushed juvenile with traces of the shell (MF 26).

D i s c u s s i o n. *A. (L.) ornatus* is distinguished from *A. (L.) proximus* by its more delicate and finer ribbing on the upper half of the whorl flank, the almost total effacement of the rib pattern on the lower whorl flank and the presence of relatively few, but pronounced, umbilical bullae. The Misburg specimen, although a crushed juvenile, shows the ornament pattern of *A. (L.) ornatus* but it is too small for positive identification.

Superfamily Acanthocerataceae HYATT 1900

Family Lyelliceratidae SPATH 1921

Subfamily Stoliczkainae BREISTROFFER 1953

Genus *Stoliczkaia* NEUMAYR 1875

Subgenus *Stoliczkaia* sensu stricto

cf. *Stoliczkaia (Stoliczkaia) notha* (SEELEY)

Plate 2, Fig. 10

cf. 1931 *Stoliczkaia notha* (SEELEY) SPATH 335—7, Pl. XXXI, figs. 1, 5a, b, 6
8a, b, 11; Pl. XXXII, figs. 6a, b, text fig. 110a—c. With synonymy.

cf. 1968 *Stoliczkaia notha notha* (SEELEY) RENZ, 50, Taf. 6, fig. 11a, b, text fig. 16g.

M a t e r i a l. One broken fragment of the shell of the body chamber (MF 49).

D i s c u s s i o n. Unfortunately, this is the only specimen in the Misburg collection that can be referred to the genus *Stoliczkaia*. The fragment shows that the whorl section is well rounded and bears the coarse rib pattern of *S. (S.) notha notha* (SEELEY). There is sufficient of the shell preserved to show that it is more evolute and inflated than *S. (S.) clavigera* NEUMAYR, a species which possesses otherwise a similar rib pattern. The lectotype of *S. (S.) notha notha* figured by SPATH (Sedgwick Museum No. B 46) is an inner whorl with only the beginning of the coarse mature ribbing preserved. The outer whorl of the typical form is probably represented by the specimen figured by RENZ (1968, pl. 6, figs. 11a, b) with which the Misburg fragment is compared. The evolute forms *S. (S.) notha inflata* SPATH and *S. (S.) notha ultima* SPATH are considered here to represent a single distinct species of *Stoliczkaia (Stoliczkaia)* for which the name *inflata* SPATH (1931: 335—7) has page priority.

SCHOLZ (1979a: 83—89; 1979b: 603—4) lumped together the various species of *Stoliczkaia (Stoliczkaia)* into a single species *S. (S.) dispar* (D'ORBIGNY). Most ammonite systematists are aware of the relatively wide variation to be seen in a single ammonite 'species' and indeed, of the impossibility of being able to recognise any species of ammonite in the biological sense. However, it is useful for systematists and essential for biostratigraphers to have names available for well differentiated, albeit morphologically variable forms. It serves no useful purpose to lump coarse-ribbed evolute forms with well-rounded whorl sections, such as *S. (S.) inflata* SPATH with the true *S. (S.) dispar* (D'ORBIGNY) which possesses involute discoidal whorls, a reduced ornament and an almost smooth mature body chamber.

3. Correlations

The ammonite faunule from the marls of the Mittelland-Kanal section at Misburg, described here can be correlated with sediments of the more marginal F l a m m e n m e r g e l facies of the Salzgitter area near the Harz. During a visit to Hannover in 1972 the writer identified specimens in the HAPKE collection obtained from a quarry cut in F l a m m e n m e r g e l in the Hillenberg, near Salzgitter Bad. Part of this collection was listed in OWEN (1979) identified by the provisional registration numbers given to them seven years earlier. This paper is followed immediately by a paper written by SCHOLZ (1979b) in which the ammonites of the HAPKE collection are fully described and some illustrated, the latter having been given different registration numbers to those used by the present writer and in some instances different names. In order to avoid future confusion, the numbering and identifications used in these two papers are compared in the Appendix.

It is, however, important to note here that the interpretation of the genus *Mortoniceras* and of the species *M. (M.) rostratum* by SCHOLZ (1979a, 1979b) is considered here to be incorrect. SCHOLZ (1979b, Fig. 2, Fig. 3) illustrated two ammonites from the Hillenberg as *Pervinquieria (Subschloenbachia) rostrata* (SOWERBY). The original of his

Fig. 2 is quadrituberculate and is a *Mortoniceras (Durnovarites) perinflatum* as also is the specimen figured by him (1979 a, Pl. 27, fig. 2), whereas the original of his Fig. 3 is trituberculate and is a *Mortoniceras (Mortoniceras) rostratum*. It is known that *M. (M.) rostratum* (J. DE C. SOWERBY) is the ancestor of the various species grouped under *Durnovarites*, and the lumping together of these two forms can only lead to biostratigraphical confusion. This is the case with the subzonal scheme proposed by SCHOLZ (1979 a: 125) where it becomes apparent that the *rostratum* Subzone is represented in both his *blancheti* and *bergeri* Subzones and the *bergeri* Subzone includes both *rostratum* and *perinflatum* Subzone faunas (Table 1).

Table 1: Zones and Subzones of the Upper Albian Substage (eg. OWEN 1983) with a comparison of SCHOLZ (1979a) for the *dispar* Zone.

Substage	Zones	Subzones	SCHOLZ (1979a)
Lower Cenomanian	{ <i>Hypoturrilites carcitensis</i>	—	—
Upper Albian	{ <i>Stoliczkaia (Stoliczkaia) dispar</i>	{ Un-named	{ <i>Schloenbachia (Preschloenbachia) briacensis</i>
		{ <i>Mortoniceras (Durnovarites) perinflatum</i>	
		{ <i>Mortoniceras (Mortoniceras) rostratum</i>	{ <i>Stoliczkaia dispar blancheti</i>
	{ <i>Mortoniceras (Mortoniceras) inflatum</i>	{ <i>Callihoplites auritus</i>	
		{ <i>Hysterocheras varicosum</i>	
		{ <i>Hysterocheras orbigny</i>	
		{ <i>Dipoloceras cristatum</i>	

Mortoniceras (M.) rostratum is present in the *Flammenmergel* of Hillenberg, although the bulk of the fauna from the higher part of the sequence is of *M. (D.) perinflatum* Subzone age. The Misburg faunule does not contain *Mortoniceras (Durnovarites)*, nonetheless, the assemblage is consistent with it being of early *perinflatum* Subzone age.

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5. Appendix

The differences in the names of the ammonites in the HAPKE collected preserved in the Niedersächsisches Landesamt für Bodenforschung given by OWEN (1979) and SCHOLZ (1979b) are due mainly to differences in taxonomic approach and nomenclature rather than to a disagreement on specific assignation. Nonetheless, there are a few important differences in specific determination, some of which have been referred to earlier in this paper. The opportunity is taken here to revise SCHOLZ's determinations of his figured specimens. His plate and figure numbers are quoted first together with his determination and kl number. This is followed by the author's AB number if given and his determination together with an inferred subzonal position in brackets.

SCHOLZ (1979b)

- Taf. 1, Fig. 1. *Lechites gaudini gaudini* (PICTET & CAMPICHE) kl 48 = AB 28 *Lechites gaudini* (P. & C.) (*rostratum-perinflatum* Subzones).
- Fig. 2. *Anisoceras (Idihamites) dorsetensis* SPATH kl 49 = *Idihamites ?elegantulus* SPATH non SCHOLZ (*perinflatum* Subzone).
- Figs. 3—4. *Hamites virgulatus* BRONGNIART kl 50 = AB 23 *Hamites (Stomohamites) venetianus* PICTET (?*rostratum* & *perinflatum* Subzone).
- Fig. 5. *Lechites gaudini gaudini* (PICTET & CAMPICHE) kl 51 = AB 30 *Lechites gaudini* (P. & C.) (*rostratum-perinflatum* Subzones).
- Fig. 6. *Anisoceras (Anisoceras) armatum* (SOWERBY) kl 52 = *Anisoceras* cf. *exoticum* SPATH (*perinflatum* Subzone).
- Fig. 7. *Anisoceras (Anisoceras) armatum* (SOWERBY) kl 53 = AB 26 *Anisoceras picteti* SPATH (*perinflatum* Subzone).
- Fig. 8. *Anisoceras (Anisoceras) armatum* (SOWERBY) kl 54 = *Anisoceras* sp. (*perinflatum* Subzone).
- Taf. 2, Figs. 1—2 & Taf. 4, Fig. 5. *Pervinqueria (Subschloenbachia) rostrata* (SOWERBY) kl 55 = AB 8 *Mortoniceras (Durnovarites)*, cf. *subquadratum* (SPATH) (*perinflatum* Subzone).
- Fig. 3. *Anisoceras (Idihamites) dorsetensis* SPATH kl 56 = *Idihamites* cf. *dorsetensis* SPATH (*perinflatum* Subzone).
- Fig. 4. *Anisoceras (Idihamites) dorsetensis* SPATH kl 57 = *Idihamites* cf. *exoticum* SPATH (*perinflatum* Subzone).
- Figs. 5—6. *Anisoceras (Idihamites) elegantulus* SPATH kl 58 = *Idihamites* cf. *dorsetensis* SPATH (*perinflatum* Subzone).
- Figs. 7—8. *Anisoceras (Idihamites) elegantulus* SPATH kl 59 = *Idihamites* cf. *dorsetensis* SPATH (*perinflatum* Subzone).
- Figs. 9—10 & Taf. 3, fig. 5. *Anisoceras (Idihamites) elegantulus* SPATH kl 60 = AB 24 *Idihamites* sp. nov. (*perinflatum* Subzone).
- Taf. 3, Fig. 1. *Puzosia (Puzosia) planulata* (SOWERBY) kl 61 = AB 4 *Puzosia* cf. *mayoriana* (D'ORBIGNY) (*rostratum-perinflatum* Subzones → Cenomanian).
- Figs. 2—4. *Pleurohoplites (Callihoplites)* cf. *vraconensis* (PICTET & CAMPICHE) kl 62 = AB 14 *Callihoplites* cf. *vraconensis* (P. & C.) (*perinflatum* Subzone).
- Fig. 5. See Taf. 2, figs. 9—10.
- Fig. 6. *Pleurohoplites (Callihoplites) tetragonoides* SPATH kl 63 = AB 13 *Callihoplites* cf. *tetragonus compressa* SPATH (*perinflatum* Subzone).

Figs. 7—8. *Pleurohoplites* (*Callihoplites*) *ambiguus* RENZ kl 64 = AB 21 *Pleurohoplites* aff. *renauxianus* (D'ORBIGNY) (*perinflatum* Subzone).

Fig. 9. *Pleurohoplites* (*Arrhaphoceras*) *precoupei* SPATH kl 65 = *Arrhaphoceras* sp. (*perinflatum* Subzone).

Taf. 4, Fig. 1. *Pleurohoplites* (*Callihoplites*) cf. *gymnus* (SEELEY) kl66 = AB 22 *Callihoplites seeleyi* SPATH (*rostratum* & *perinflatum* Subzones).

Fig. 2. *Pleurohoplites* (*Arrhaphoceras*) cf. *substuderi* SPATH kl67 = AB 16 *Arrhaphoceras* cf. *substuderi* SPATH (*perinflatum* Subzone).

Figs. 3—4. *Pleurohoplites* (*Arrhaphoceras*) *precoupei* SPATH kl 68 = *Arrhaphoceras* sp. cf. *studeri* (PICTET & CAMPICHE) (*perinflatum* Subzone).

Fig. 5. See Taf. 2, figs. 1—2.

Fig. 6. *Pleurohoplites* (*Arrhaphoceras*) *precoupei* SPATH kl 69 = AB 10 *Arrhaphoceras precoupei* SPATH (*perinflatum* Subzone).

Fig. 7. *Pleurohoplites* (*Pleurohoplites*) sp. indet. kl70 = *Pleurohoplites* sp. indet. (*perinflatum* Subzone).

Fig. 8. *Pleurohoplites* (*Leptihoplites*) cf. *pseudoplanus* SPATH kl71 = *Leptihoplites* cf. *pseudoplanus* SPATH (*perinflatum* Subzone).

Fig. 9—10. *Pleurohoplites* (*Arrhaphoceras*) cf. *precoupei* SPATH kl72 = *Arrhaphoceras precoupei* SPATH (*perinflatum* Subzone).

Taf. 5, Fig. 1. *Pervinquieria* (*Subschloenbachia*) *rostrata* (SOWERBY) kl73 = *Mortoniceras* (*Mortoniceras*) aff. *rostratum* trans. to *M.* (*Durnovarites*) (basal *perinflatum* Subzone).

Fig. 2. *Stoliczkaia dispar dispar* (D'ORBIGNY) kl74 = AB9 *Stoliczkaia* (*Stoliczkaia*) cf. *notha* (SEELEY) (*perinflatum* Subzone).

Fig. 3. *Pleurohoplites* (*Callihoplites*) *pulcher* SPATH kl74 = AB 12 *Callihoplites* cf. *vraconensis* (PICTET & CAMPICHE) (*perinflatum* Subzone).

Fig. 4—5. *Pervinquieria* (*Subschloenbachia*) *perinflata* SPATH kl 75 = AB 7 *Mortoniceras* (*Durnovarites*) cf. *quadratum* (SPATH) (*perinflatum* Subzone).

Fig. 6. *Stoliczkaia dispar dispar* (D'ORBIGNY) kl77 = *Stoliczkaia* (*Stoliczkaia*) cf. *dorsetensis* SPATH (*perinflatum* Subzone).

Fig. 7. *Pleurohoplites* (*Pleurohoplites*) cf. *subvarians* SPATH kl 78 = AB 17 *Pleurohoplites* cf. *subvarians* SPATH (*perinflatum* Subzone).

Text-Abb. 2. *Pervinquieria* (*Subschloenbachia*) *rostrata* (SOWERBY) kl79 = *Mortoniceras* (*Durnovarites*) *perinflatum* (SPATH) (*perinflatum* Subzone).

Text-Abb. 3. *Pervinquieria* (*Subschloenbachia*) *rostrata* (SOWERBY) kl80 = *Mortoniceras* (*Mortoniceras*) *rostratum* (J. DE C. SOWERBY) (*rostratum* Subzone).

The remaining HAPKE collection specimens with AB numbers not listed above are as identified in OWEN (1979: 577).

6. Catalogue of the Misburg Faunule of the MEYER & SCHMIDTKE Collection *)

No.	Identification (H. G. OWEN)
MF 1a, b ctps	cf. <i>Worthoceras</i> sp. ind. Coll.? 6a, b.
MF 2	cf. <i>Lechites communis</i> SPATH. Dirk Meyer Coll. 4.
MF 3	<i>Scaphites simplex</i> JUKES BROWNE). Dirk Meyer Coll. 3
MF 4	<i>Scaphites simplex</i> (JUKES BROWNE)
MF 5	cf. <i>Idiohamites dorsetensis</i> SPATH, juvenile
MF 6	<i>Idiohamites elegantulus elegantulus</i> SPATH
MF 7a, b ctps	<i>Ostlingoceras</i> sp. ind.
MF 8a, b ctps	cf. <i>Idiohamites dorsetensis</i> SPATH, juvenile
MF 9	<i>Idiohamites elegantulus elegantulus</i> SPATH
MF 10	<i>Idiohamites dorsetensis</i> SPATH
MF 11	<i>Idiohamites elegantulus elegantulus</i> SPATH
MF 12a, b ctps	<i>Idiohamites elegantulus elegantulus</i> SPATH
MF 13	<i>Idiohamites elegantulus elegantulus</i> SPATH <i>Callihoplites</i> cf. <i>leptus</i> (SEELEY)
MF 14	<i>Idiohamites elegantulus elegantulus</i> SPATH
MF 15a, b ctps MF 15b)	<i>Idiohamites elegantulus laticostatus</i> RENZ
MF 16	<i>Idiohamites elegantulus elegantulus</i> SPATH
MF 17	<i>Puzosia</i> (<i>Puzosia</i>) <i>mayoriana</i> (D'ORBIGNY)
MF 18	<i>Anahoplites</i> (<i>Leptihoplites</i>) <i>pseudoplanus</i> SPATH
MF 19	<i>Anahoplites</i> (<i>Leptihoplites</i>) <i>pseudoplanus</i> SPATH
MF 20	<i>Anahoplites</i> (<i>Leptihoplites</i>) <i>falcoides</i> SPATH
MF 21	<i>Anahoplites</i> (<i>Leptihoplites</i>) <i>falcoides</i> SPATH
MF 22	<i>Anahoplites</i> (<i>Leptihoplites</i>) <i>pseudoplanus</i> SPATH
MF 23	<i>Anahoplites</i> (<i>Leptihoplites</i>) <i>proximus</i> SPATH
MF 24	<i>Callihoplites</i> cf. <i>cratus</i> (SEELEY)
MF 25	<i>Callihoplites</i> cf. <i>cratus</i> (SEELEY)
MF 26	<i>Anahoplites</i> (<i>Leptihoplites</i>) cf. <i>ornatus</i> SPATH

*) Ammonites only

MF 27	cf. <i>Lechites communis</i> SPATH, doubtful specimen
MF 28	cf. <i>Lechites communis</i> SPATH, doubtful specimen
MF 29	cf. <i>Lechites communis</i> SPATH, doubtful specimen
MF 30a, b ctps	cf. <i>Idiohamites dorsetensis</i> SPATH, juvenile
MF 31	cf. <i>Idiohamites dorsetensis</i> SPATH, juvenile
MF 32	<i>Idiohamites dorsetensis</i> SPATH
MF 33	<i>Idiohamites elegantulus elegantulus</i> SPATH
MF 34	cf. <i>Idiohamites dorsetensis</i> SPATH, juvenile
MF 35	<i>Idiohamites</i> sp.
MF 36	<i>Idiohamites</i> sp.
MF 37	<i>Scaphites simplex</i> (JUKES BROWNE)
MF 38	<i>Scaphites simplex</i> (JUKES BROWNE)
MF 39	<i>Scaphites simplex</i> (JUKES BROWNE)
MF 40	<i>Anahoplites (Lepthoplites) falcooides</i> SPATH
MF 41	<i>Anahoplites (Lepthoplites)</i> sp.
MF 42	<i>Anahoplites (Lepthoplites)</i> sp. ind.
MF 43	<i>Anahoplites (Lepthoplites) falcooides</i> SPATH
MF 44	<i>Anahoplites (Lepthoplites)</i> cf. <i>pseudoplanus</i> SPATH
MF 45	<i>Anahoplites (Lepthoplites) falcooides</i> SPATH
MF 46	<i>Anahoplites (Lepthoplites)</i> cf. <i>pseudoplanus</i> SPATH
MF 47	<i>Anahoplites (Lepthoplites) proximus</i> SPATH
MF 48	<i>Anahoplites (Lepthoplites) pseudoplanus</i> SPATH
MF 49	cf. <i>Stoliczkaia (Stoliczkaia) notha</i> SEELEY

The specimens are stored in the BGR reference collection under Nos kl 225—273.

Plate 1

Ammonites from the *dispar* Zone, *perinflatum* Subzone of the Mittelland Kanal section at Misburg, Hannover.

- Fig. 1. cf. *Lechites communis* SPATH portion of a crushed straight shaft (MF2).
- Fig. 2. *Idiohamites elegantulus elegantulus* SPATH (MF12).
- Fig. 3. *Idiohamites elegantulus elegantulus* SPATH (MF14).
- Fig. 4. *Idiohamites elegantulus elegantulus* SPATH obliquely crushed specimen with spines preserved (MF6).
- Fig. 5. *Idiohamites elegantulus elegantulus* SPATH immature individual with more involute initial whorls (MF11).
- Fig. 6. *Idiohamites elegantulus latecostatus* RENZ (MF15).
- Fig. 7. *Idiohamites dorsetensis* SPATH note the more tightly coiled inner whorls (MF10).
- Fig. 8. *Idiohamites dorsetensis* SPATH immature individual showing the initial whorl (MF8).
- Figs. 9a, b. *Ostlingoceras* sp. ind. (a) steinkern and (b) external cast, of an immature individual (MF7).
- Fig. 10. *Scaphites simplex* JUKES-BROWNE typical crushed individual (MF4).
- Fig. 11. *Scaphites simplex* JUKES-BROWNE group of immature individuals collected together in a 'shell clump' (MF3).
- Figs. 12a, b. cf. *Worthoceras* sp. ind. unique steinkern (a) and external cast (b) (MF1).
- Fig. 13. *Puzosia (Puzosia) mayoriana* (D'ORBIGNY) (MF17).

All specimens $\times 1$ and sprayed with ammonium chloride dust.

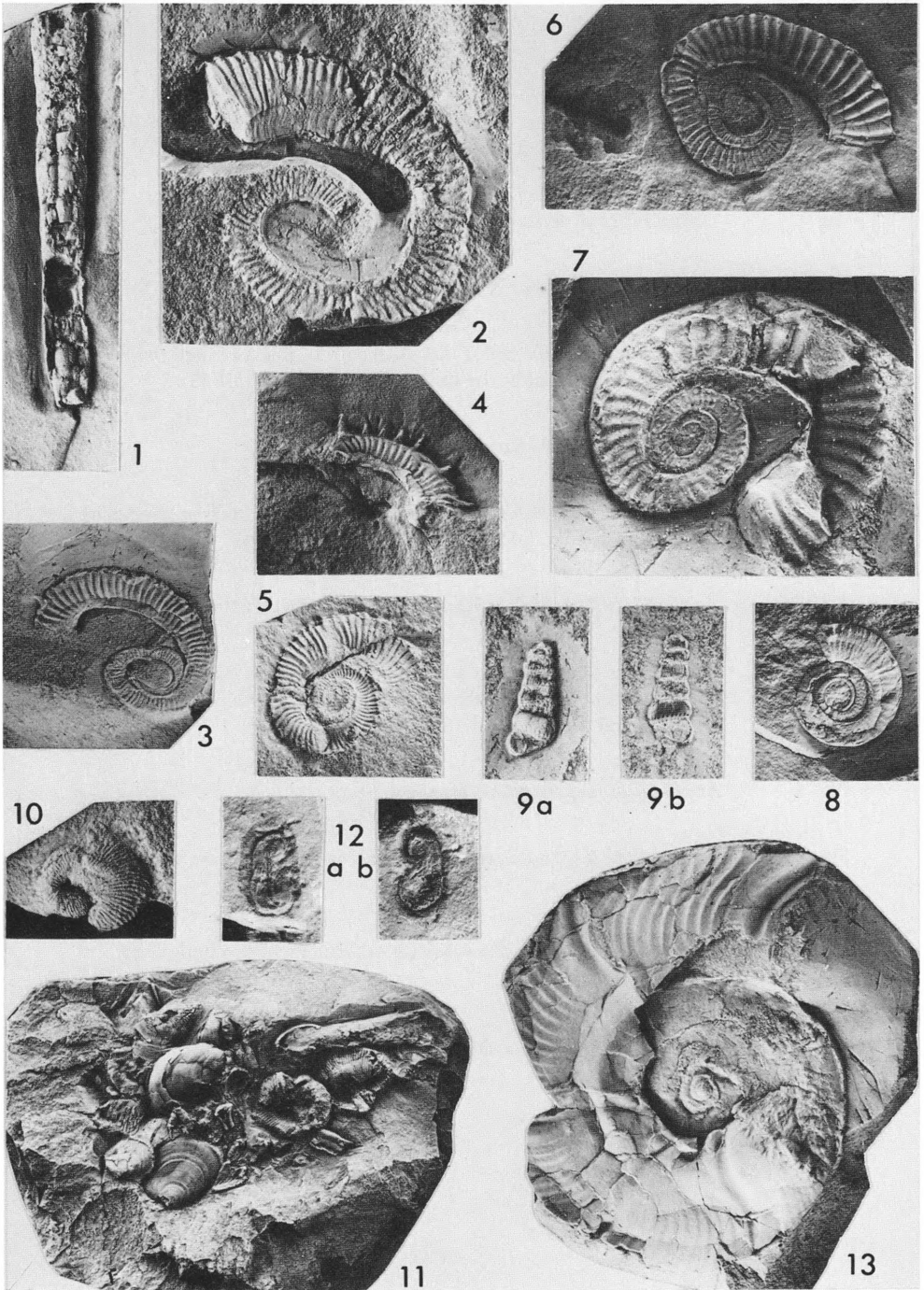


Plate 2

Ammonites from the *dispar* Zone, *perinflatum* Subzone of the Mittelland Kanal section at Misburg, Hannover.

- Fig. 1. *Callihoplites* cf. *leptus* (SEELEY) (MF13).
- Fig. 2. *Callihoplites* cf. *cratus* (SEELEY) obliquely crushed individual (MF25).
- Fig. 3. *Anahoplites* (*Lepthoplites*) *falcoides* SPATH mature shell with an immature individual in the broken body chamber (MF20).
- Fig. 4. *Anahoplites* (*Lepthoplites*) *falcoides* SPATH (MF21).
- Fig. 5. *Anahoplites* (*Lepthoplites*) *pseudoplanus* SPATH, finely ribbed and partly-worn steinkern (MF22).
- Fig. 6. *Anahoplites* (*Lepthoplites*) *pseudoplanus* SPATH (MF19).
- Fig. 7. *Anahoplites* (*Lepthoplites*) aff. *pseudoplanus* SPATH transitional form to *A. (L.) ornatus* SPATH with more pronounced umbilical bullae and ventro-lateral tubercles (MF18).
- Fig. 8. *Anahoplites* (*Lepthoplites*) *proximus* SPATH (MF23).
- Fig. 9. *Anahoplites* (*Lepthoplites*) cf. *ornatus* SPATH, immature individual (MF26).
- Fig. 10. cf. *Stoliczkaia* (*Stoliczkaia*) *notha* (SEELEY) fragment of a body chamber (MF49).

All specimens $\times 1$ and sprayed with ammonium chloride dust.

