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# CALLOVIAN AMMONITES (*LAMBERTI*-ZONE) FOUND IN AN ERRATIC CONCRETION NEAR SVEDALA, SCANIA

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*Abstract.* An erratic concretionary block found near Svedala, Scania, contains abundant, excellently preserved ammonites of the species *Quenstedtoceras henrici* R. Douvillé, *Q.* aff. *mariae* (d'Orbigny), *Q. praelamberti* R. Douvillé?, *Q. vertumnum* (Leckenby)? and *Kosmoceras spinosum* (Sowerby), an assemblage typical of the *lamberti*-zone of the uppermost Callovian of the Middle Jurassic. The ammonite association in the block is identical with that described and figured by Makowski (1952, 1962) from concretions in an erratic clay near Łúków, Poland, and upon which he based his theory of sexual dimorphism in ammonites. Sexual dimorphism could be established for *Q. henrici* and *K. spinosum* in the present material. It is suggested that the block has come from somewhere in the south-western Baltic Sea, not far from the present coast of southeastern Sweden, and that it has been transported by the "last" ice movements.

## INTRODUCTION

The concretionary block yielding the ammonites treated in this paper was forwarded to me in August, 1970, by Professor Gerhard Regnéll, Department of Historical Geology and Paleontology, University of Lund. It was collected by Mr. Ernst Nilsen of Malmö, who found it in June, 1970 in a hole formed by an uprooted tree on route 11 near the first turn-off to the right, about 2 km from the branch-off to Svedala centre in the direction Malmö—Ystad.

A preliminary examination of the fossils in the block showed it to be of exceptional paleontological interest. Although it has obviously been transported by ice, it could clearly not have been carried far, and may be expected to have originated from some site in the southwestern area of the Baltic Sea. This hypothesis has been strengthened by the publication of the first record of autochthonous Callovian in Sweden by Norling (1970).

Twenty years ago it was thought that the Swedish marine Jurassic comprised only a relatively small part of the Lias. Subsequent studies have shown (Bölau, 1959; Reyment, 1958, 1969 a, 1969 b) that ammonitiferous Jurassic is much more common than previously suspected and that the Jurassic is really quite well represented; it is now known to comprise not only Lias but also Dogger and Malm (Norling, 1970).

All figured material has been deposited in the type collection of the University of Lund.

## DESCRIPTION OF THE ERRATIC BLOCK

The block containing the Upper Callovian ammonites was about 3—4 kg in weight before treatment, light grey in colour and of a marly character. Two views of it are shown in Pl. 1; the lower pictures on the plate show its appearance in a stereoscopic pair before developing of the fossils. Features of interest here are: the random orientation of the fossils, the occurrence of fossil wood, and a worn fracture surface. The upper picture displays the appearance of the block after initial removal of matrix. The amazing richness in fossils is apparent; a specimen of the pelecypod *Nucula calliope* d'Orbigny is visible in the upper right-hand corner. The ammonites belong almost entirely to *Quenstedtoceras henrici* R. Douvillé.

The fossils are in an excellent state of preservation and the shell substance of the ammonites is aragonitic and virtually in the same state as when buried. Many of the inner whorls remain air-filled (Pl. 3, Figs. 5—7; Pl. 5, Figs. 4, 6). The enclosing sediment and many of the fossils display a high degree of pyritization (Pl. 4, Fig. 5); some smaller ammonites are completely pyritized.

## DESCRIPTION OF THE AMMONITES

The most commonly occurring species is *Quenstedtoceras henrici* R. Douvillé, thereafter *Quenstedtoceras* aff. *mariae* (d'Orbigny). Individuals determined as *Q. vertumnum* (Leckenby)? and *Q. praelamberti* R. Douvillé? are rare. *Kosmoceras spinosum* (Sowerby) may be considered moderately common.

### *Quenstedtoceras henrici* R. Douvillé

Most of the material referred to this species consists of juvenile individuals the sex of which is not possible to determine by recourse to Makowski's criteria.

Makowski (1962, pp. 35—36) found that the females of *Quenstedtoceras* consist of 7—8 whorls and that they are significantly larger than the forms he classified as males, which usually comprise about 6 whorls. He observed that up to a growth stage of about 5—5½ whorls the ontogeny of both categories is identical, whereafter differences occur in the shape of the whorl section, the width of the umbilicus and in the ornament.

The material from Svedala contains two individuals identifiable as females on the basis of Makowski's criteria (Pl. II, Figs. 1, 2, a—b). One of these specimens (Pl. II, Fig. 1) shows the ventral "hood" and the virtually smooth body chamber of the species. Males are more numerous. The characteristic apertural lip occurs and the specimens bear the typical ornament of the body chamber. Examples of males are figured in Pl. II, Figs. 3, 4, 5, a—b, 6.

Makowski (1962, p. 35) noted that the females in the collection of Łúków fossils range in maximum diameter from 105 mm to 220 mm and that males vary from 24 mm to 65 mm. The larger female in the Svedala collection is only 90 mm in maximum diameter, the males range from 40 mm to 51 mm.

Many individuals with air-filled chambers occur (two examples are shown in Pl. III, Figs. 5, 6) in which the details of the cameral walls may be seen. The ontogenetic development of the earliest whorls is shown in three dimensions in Pl. V, Figs. 4—6. These illustrations of a single specimen viewed from both sides include also the proloculus. The external ontogeny of the surface sculpture is depicted in Pl. IV, Figs. 2, a—b.

Makowski (1962) recognized three groups in his extensive material of *Q. henrici*, namely, coarsely ribbed individuals, normally ribbed individuals and finely ribbed individuals. Pertinent details concerning the ribbing density were extracted from Makowski's plates of males of *henrici* and plotted on a scatter diagram (Fig. 1). This diagram shows that for the most part there is a clear and well-defined grouping into the three costational categories. Ribbing densities for the male specimens in the Svedala collection were determined and plotted on the same diagram. It will be seen that these values lie well within the normal range of variation for the Polish specimens.

### *Quenstedtoceras* aff. *mariae* (d'Orbigny)

Several small specimens are referred here. Owing to the difficulty attaching to the interpretation of *Q. mariae,* a species in bad need of revision, it has not been possible to venture a more precise determination than the one given here. Although I am reasonably certain that my material does not belong to *mariae*, though related, it is not possible to proffer a definite opinion without the presence of adult specimens. Specimens of the forms placed here are shown in Pl. III, Figs. 1, a—b, 3, a—b, 4 and 9. A stereoscopic view of a specimen is given in Pl. V, Figs. 2, a—b, 3, a—b. Makowski (1952) referred this, or a closely similar species to *Q. mariae*, but this was subsequently made the subject of a redetermination by Arkell (1956, p. 482) who referred the form in question to *Quenstedtoceras* aff. *damoni* (Nikitin). As also observed by Makowski (1952) and Arkell (1956, p. 482), this

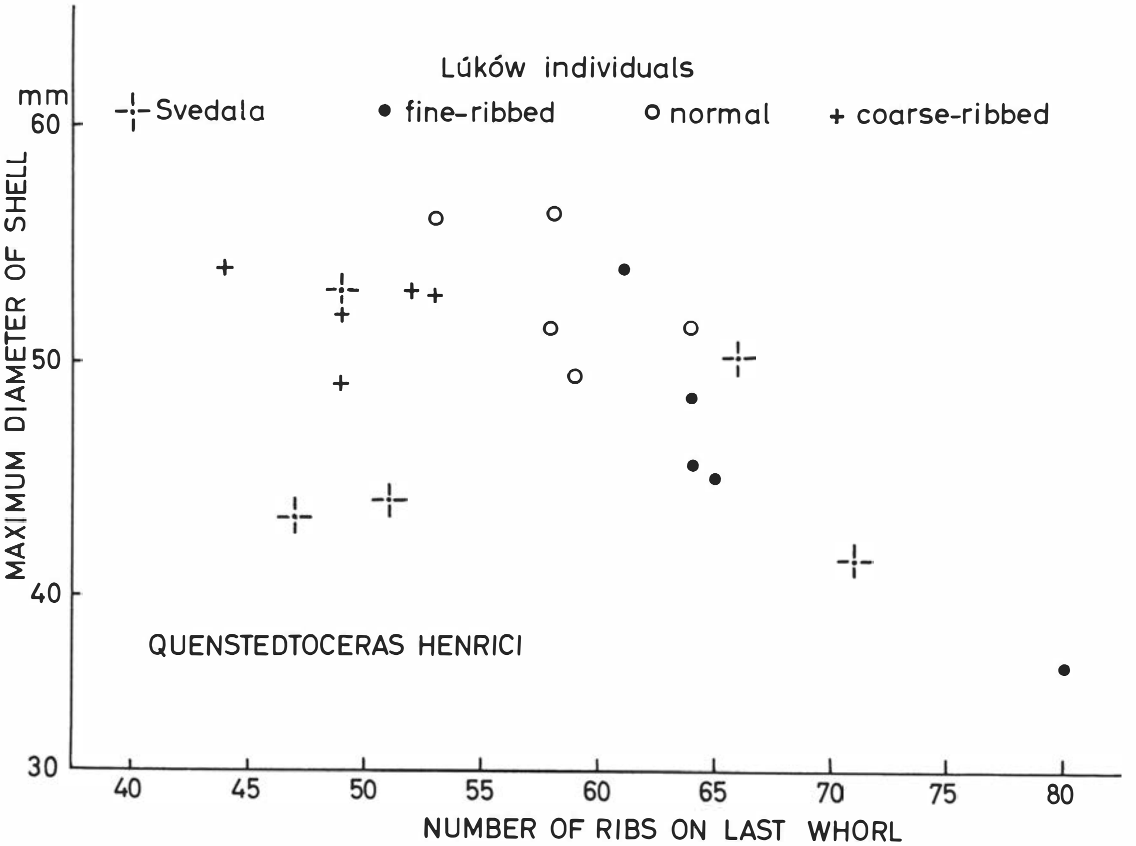


*Fig. 1.* Scatter diagram of number of ribs per whorl against maximum diameter for males of *Quenstedtoceras henrici* from Svedala and Łúków.

species seems to be present in the association at Łúków, although Makowski (1962, p. 76) later included this material in his revised concept of *Q. mariae.*

*Quenstedtoceras vertumnum* (Leckenby)?

I have doubtfully referred one specimen of the collection to this species. It is figured as Pl. III, Figs. 2, a—b. The species *Q. vertumnum* is a rather doubtful category and some believe it to fall within the range of variation of *mariae.* Maire (1937, p. 35), for example, retained it as a valid species but pointed out its close affinities with *Q. mariae*, from which he claimed he could distinguish it only in the adult stage.

*Quenstedtoceras praelamberti* R. Douvillé?

A single specimen is referred with some doubt to this species. Makowski (1962, p. 75) recorded *Q. praelamberti* from Łúków, where it is among the rarer of the species of *Quenstedtoceras.* The ornament is usually said to be characterized by the occurrence of two secondary ribs between two primary ribs; the stereopair figured here as Pl. V, Figs. 1, a—b shows the occasional appearance of such a rib combination, although its more common costal pattern is more of the *henrici* type. Maire (1937) considered *Q. praelamberti* as typical of the lower part of the *lamberti*-zone, which does not conflict with the general aspect of the association described in this paper.

*Kosmoceras spinosum* (Sowerby)

Several well-preserved specimens of this species occur in the Svedala association, among them the female figured in Pl. IV, Figs. 1, a—b and the male figured in Pl. III, Fig. 8. *K. spinosum* does not occur above the *lamberti* zone and thus offers a firm anchor for the stratigraphic location of the association, in addition to the aspect of the quenstedtoceratids.

Makowski (1962, p. 69) concluded that females of *Kosmoceras* consist of at least 7 whorls and males of 6 whorls and an aperture provided with lappets.

The ornament of the final part of the body chamber of mature males is modified so as to conform with this outgrowth of the shell. The ornament of the earliest whorls of *K. spinosum* is shown in Pl. III, Fig. 7 and Pl. IV, Fig. 4.

*Proportions between the sexes*

Although the material available to me is insufficient to allow an analysis of the sexual ratios of the various species, Makowski's (1962) published information permits conclusions concerning the proportions for *Quenstedtoceras henrici* and *Kosmoceras spinosum.*

His figures for *K. spinosum* indicate that he had a total sample of 79 adults of this species of which 54.4 % were females. The 95 percent confidence interval for this proportion is 0.43—0.65, which embraces the Mendelian proportion of 0.5 : 0.5 for sexes.

The proportion of males to females for *Q. henrici* in a total sample of 312 individuals was determined to be 0.263. The 95 percent confidence interval for this proportion is 0.21—0.31, which differs quite emphatically from the classical Mendelian sex ratio; it is less than a relationship of one third females to two thirds males.

## STRATIGRAPHICAL LOCATION

The ammonite association found in the block from Svedala is in all respects characteristic of the zone of *Quenstedtoceras lamberti*, although this species is not present. In addition to the ammonites already described, there are fragments of belemnites and several species of pelecypods and gastropods amongst which the following have been identified: *Gryphea* sp., *Astarte cordata* Trautschold, *Macrodon elatmense* Borissiak, *Nucula calliope* d'Orbigny, *Pinna* cf. *mitis* Phillips, and *Purpurina coronata* Hebert & Deslongchamps.

Upper Callovian of the age of the *lamberti*-zone is known from many parts of the Baltic region, mostly from glacial erratics, but also from outcrops in scattered inliers in Pomerania, Lithuania and Latvia. Numerous studies have been made in the past on the fossil contents of the smaller erratics and a large mass of soft clay of Callovian age at Łúków, Poland, was only recognized as being glacially displaced as late as some 20 years ago (Makowski, 1952). Callovian and Oxfordian appear to be condensed but reasonably complete (Arkell, 1956) in Lithuania in river sections at Popilani (Krenkel, 1915), and near the coast at Memel. The ammonites are excellently preserved. The *lamberti*-zone is represented by *Quenstedtoceras henrici* and *Kosmoceras spinosum*, but the zonal index, *Quenstedtoceras lamberti*, does not occur. Weissermel (1895) recorded similar associations from drift in the former East Prussia.

The same facies as in the Svedala block occurs in nodules spread randomly throughout the 4 m thick erratic clay mass at Łúków, already referred to above. The agreement in paleontology and lithology is so close that Makowski's description of the nodules may be applied in detail to the Scanian material. I quote from Makowski (1952, p. VIII) (... les argiles contiennent des concrétions calcaires argileuses ou sidéritiques, d'habitude fortement pyritisées. ... Leur diamètre varie entre quelques cm et 30 cm. ... Les fossiles contenus dans les concrétions sont très abondants et exceptionellement bien conservés. Les coquilles ont une belle surface luisante. Même les spécimens les plus fragiles ne sont pas écrasés. ... On trouve aussi dans les concrétions des débris de bois carbonisé et pyritisé." And, finally, Makowski's remarks on the aspect of the ammonite association, "la masse principale de la faune fossile des concrétions consiste en espèces du genre de *Quenstedtoceras*, parmi lesquelles les plus fréquentes sont: *Quenstedtoceras henrici* accompanée souvent de *Cosmoceras spinosum.*"

There can be little doubt that the two occurrences derive from the same formation.

Makowski (1962) expressed the opinion that species of *Quenstedtoceras* with undivided ribs and only one intercalatory rib are among the early representatives of the genus, while those of the type of *Q. lamberti*, with up to four intercalatory ribs, are the later derivatives. If this be correct, the present material, in common with the Łúków ammonites, should lie in time somewhere in the earlier part of the *lamberti*-zone.

Makowski (1952), as already observed, refers some of the Polish material to *Quenstedtoceras mariae*, an assignation that was disputed by Arkell (1956, p. 482). As, for example, Zeiss (1955, 1957) has amply demonstrated, the zone of *Q. mariae* is located in the lowermost Oxfordian. Moreover, *Kosmoceras* is not known to occur anywhere in the Oxfordian (e.g., Arkell, 1956). My own opinion must of necessity remain tentative, owing to the insufficient material I have had at my disposal. Examination of a concretion from Łúków, kindly placed at my disposal by Dr. H. Mutvei, Uppsala, and in which *mariae*-like forms occur, suggests that the species in question is more likely to be a close relative of *Q. mariae*, but nevertheless specifically different. One cannot be certain, unfortunately, and it will not be possible to be so, until *Q. mariae* is given a complete taxonomic revision.

It is extremely unlikely that the Svedala erratic concretion could have been transported by ice from the Warsaw area. I have discussed the problem with Professor Tage Nilsson, Department of Quaternary Geology, University of Lund, who agrees that the transport of the block from the southwestern part of the Baltic Sea by the last ice movements is the most probable direction. This would presuppose the presence of marine Middle Jurassic in the floor of the sea, a continuation of the eastern Baltic deposits.

Until very recently, the evidence for the existence of such beds has not been particularly convincing. Norling (1970, p. 264) has, however, identified Callovian foraminifers in material from boreholes put down in the Fortuna Rydebäck area a few km to the south of Hälsingborg. His sketch map (*op. cit.*, p. 263) shows the extent of subsurface Middle Jurassic in the region south of Hälsingborg and suggests it to run diagonally across southwestern Scania. Extrapolation from this map leads one to the albeit tentative conclusion that Callovian may have cropped out to the north of Svedala during the Pleistocene, and Norling has in his text actually touched upon the possible agreement of the Fortuna-Rydebäck Middle Jurassic with part of the outcropping Jurassic at Fyledalen, southeastern Scania.

Some of the foraminifers upon which Norling (1970, p. 271) based his Callovian determination are: *Citharina flabellata* (Gümbel), *C. macilenta* (Terquem), *Frondicularia nikitini* Uhlig, *F. franconica* Gümbel, *Epistomina mosquensis* Uhlig, *E. parastelligera* (Hofker), *Saracenaria cornucopiae* (Schwager), *Lenticulina tricarinella* (Reuss). Makowski (1952) recorded *Frondicularia nikitini* from Łúków, as well as *Epistomina.*

Sturesson (1971) analyzed the matrix of the Svedala concretion and that of a specimen from Łúków, Poland. He found close agreement in the minor chemical constituents to exist. For example, the averages of the determinations for strontium, iron and magnesium are identical and those for copper, $P_2O_5$, manganese and titanium agree closely.

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# PLATES

## Plate I

The upper photograph shows the appearance of the nodule after the initial development of a surface. Numerous well-preserved shells of *Quenstedtoceras henrici* are visible and a specimen of *Nucula calliope* can be seen in the top right-hand corner.

The two lower pictures form a stereoscopic pair, showing the appearance of the nodule before the extraction of the fossils.

## Plate II

*Quenstedtoceras henrici* R. Douvillé

All figures natural size unless otherwise stated.

*Fig. 1.* An almost perfectly preserved adult female individual, displaying the characteristic ornamental features. The body chamber contains a juvenile *Q. henrici.* LO 4363.

*Figs. 2, a—b.* Immature female specimen. Fig. 2 b displays the typical ventral ornament. LO 4364.

*Fig. 3.* Lateral view of a finely-ribbed male. LO 4365.

*Fig. 4.* Lateral view of a moderately coarsely ribbed individual showing the nature of some inner whorls. LO 4366.

*Figs. 5, a—b.* Two views of a male. LO 4367.

*Fig. 6.* Ventral view of the aperture of a male showing the rostral lip (× 2.3). LO 4368.

## Plate III

*Figs. 1, a—b. Quenstedtoceras* aff. *mariae* (d'Orbigny). Lateral and ventral views of an incomplete specimen (× 2.5). LO 4368.

*Figs. 2, a—b. Quenstedtoceras vertumnum* (Leckenby)? Lateral and ventral views of inner whorls. Natural size. LO 4369.

*Figs. 3, a—b. Quenstedtoceras* aff. *mariae* (d'Orbigny). Lateral and ventral view of inner whorls (× 3). LO 4370.

*Fig. 4.* Same form (× 2). LO 4371.

*Fig. 5. Quenstedtoceras* sp. juv. Section through a juvenile individual showing the cameral walls and the innermost whorls; the chambers are air-filled (× 2). LO 4372.

*Fig. 6. Quenstedtoceras* spp. Sections through juvenile individuals showing the septal faces and air-filled chambers (× 2). LO 4373.

*Fig. 7. Kosmoceras spinosum* (Sowerby). Inner whorls of specimen with air-filled inner chambers, showing the ornament of the early growth stages (× 3). LO 4374.

*Fig. 8.* Same species. Lateral view of a male. The arrow marks the beginning of the apertural lappet (× 2). LO 4375.

*Fig. 9. Quenstedtoceras* aff. *mariae* (d'Orbigny) (× 2). LO 4376.

## Plate IV

All figures natural size unless otherwise stated.

*Figs. 1, a—b. Kosmoceras spinosum* (Sowerby). Lateral and ventral views of an adult female. LO 4377.

*Figs. 2, a—b. Quenstedtoceras henrici* R. Douvillé. Specimen showing the inner whorls. LO 4378.

*Fig. 3. Quenstedtoceras* sp. juv. Juvenile individual in specimen LO 4374 (× 2).

*Fig. 4.* Conglomeration of shells of *Quenstedtoceras* and *Kosmoceras.* LO 4374.

*Fig. 5.* Slice through portion of the nodule to show abundant pyritized ammonites.

## Plate V

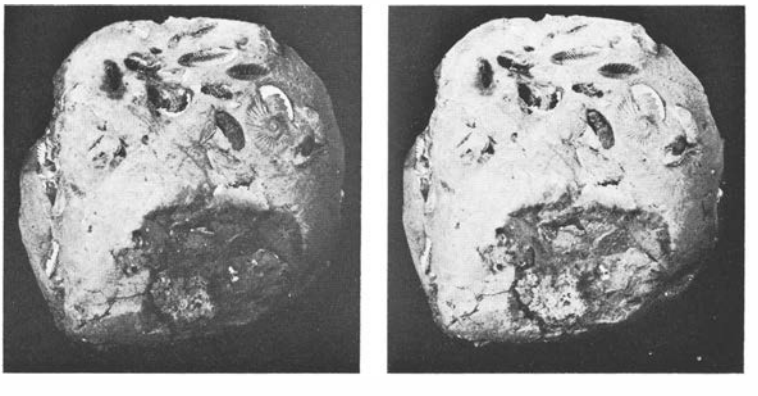
Stereoscopic pictures of *Quenstedtoceras*

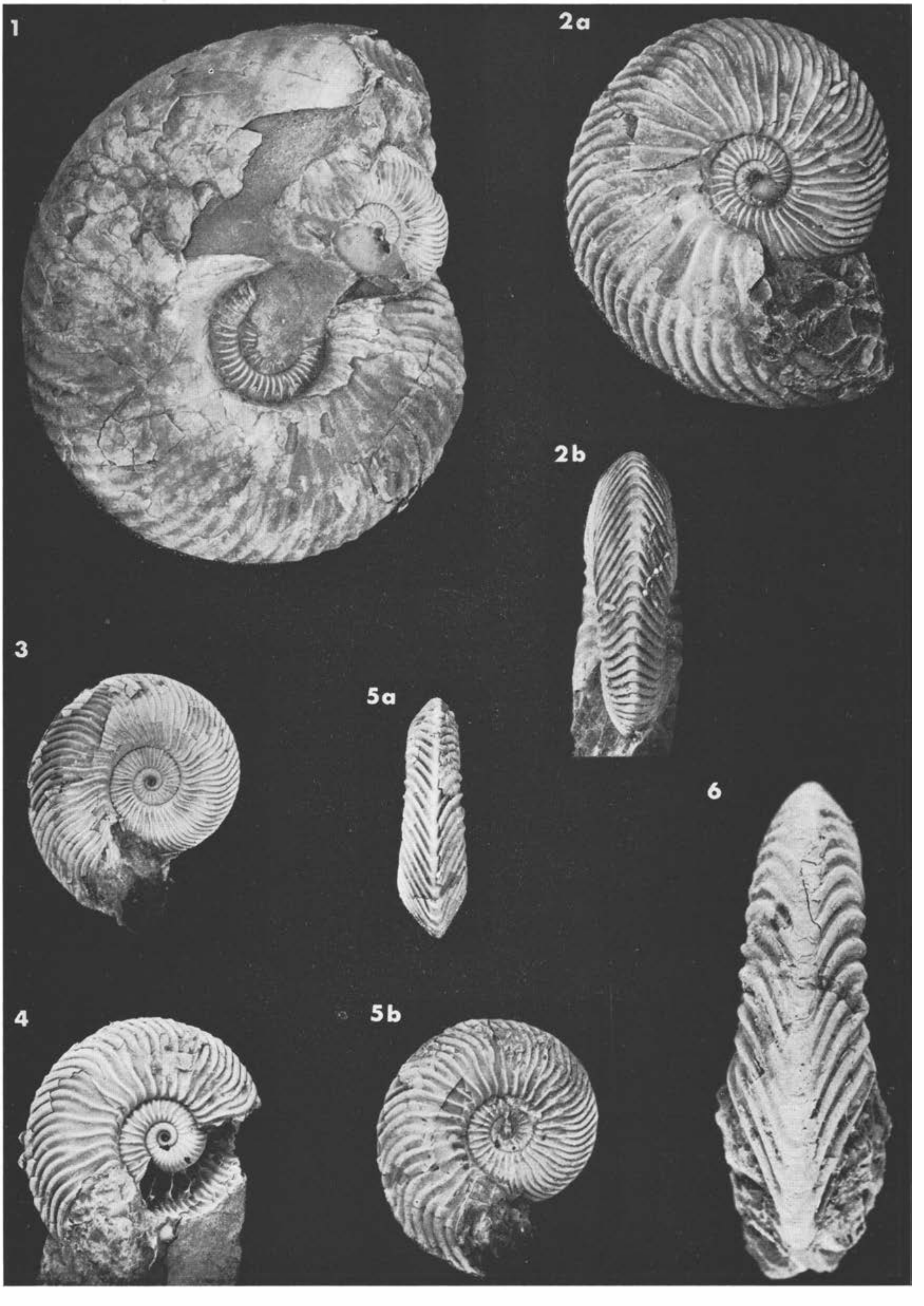
*Figs. 1, a—b. Quenstedtoceras praelamberti* R. Douvillé? This stereopair shows the occurrence of intercalatory ribs on the last whorl. Natural size. LO 4379.

*Figs. 2, a—b, 3, a—b. Quenstedtoceras* aff. *mariae* (d'Orbigny). Stereoscopic views of the side and venter. Natural size. LO 4380.

*Figs. 4, a—b, 5, a—b, 6, a—b. Quenstedtoceras henrici* R. Douvillé. Views of the innermost whorls of this species. Figs. 4 and 5 have the same orientation. Fig. 6 displays the opposite side of the specimen. Figs. 4 and 6 are reproduced at a magnification of 8 times and Fig. 6 at its natural size. LO 4381.

Plate I

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2a
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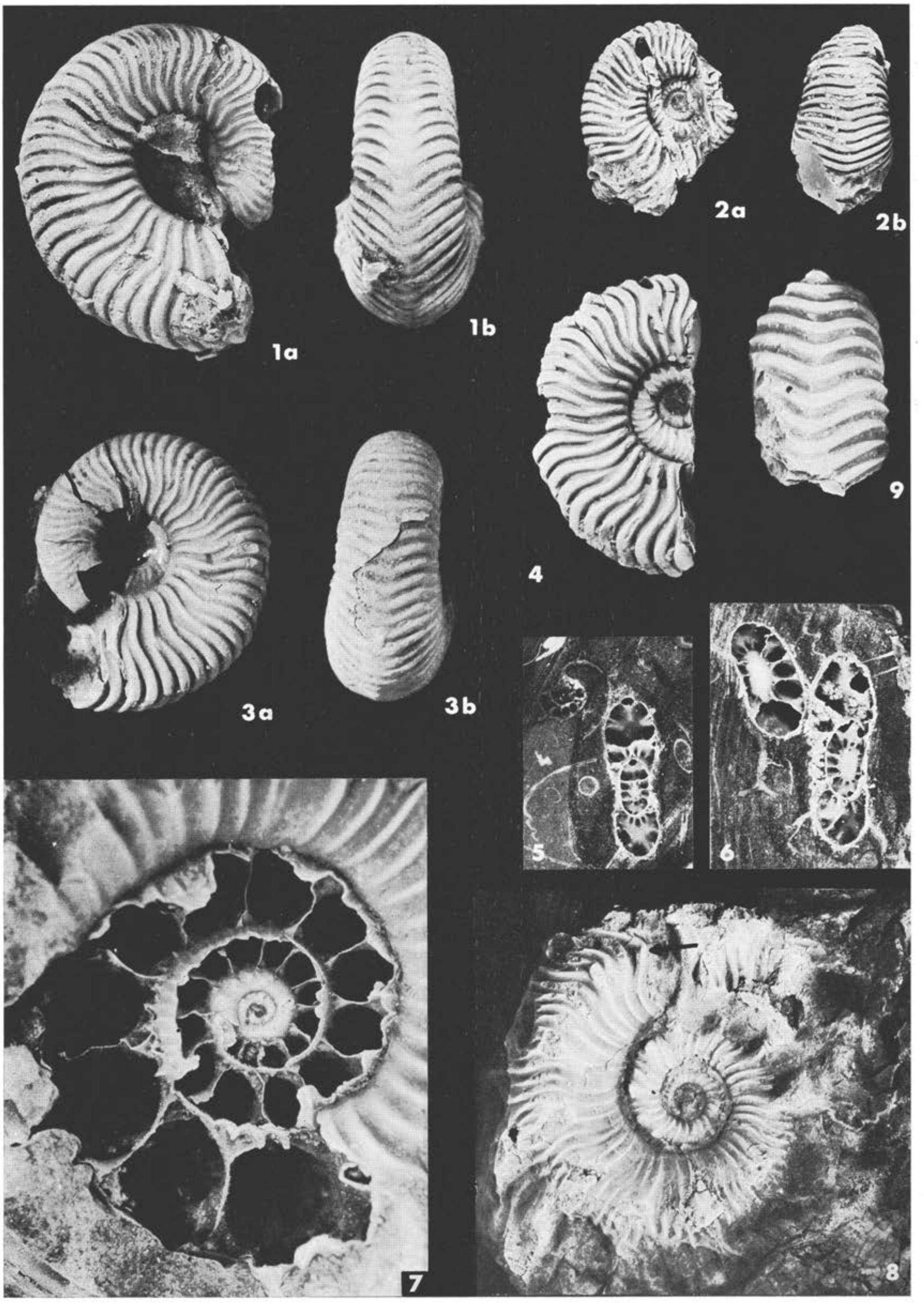
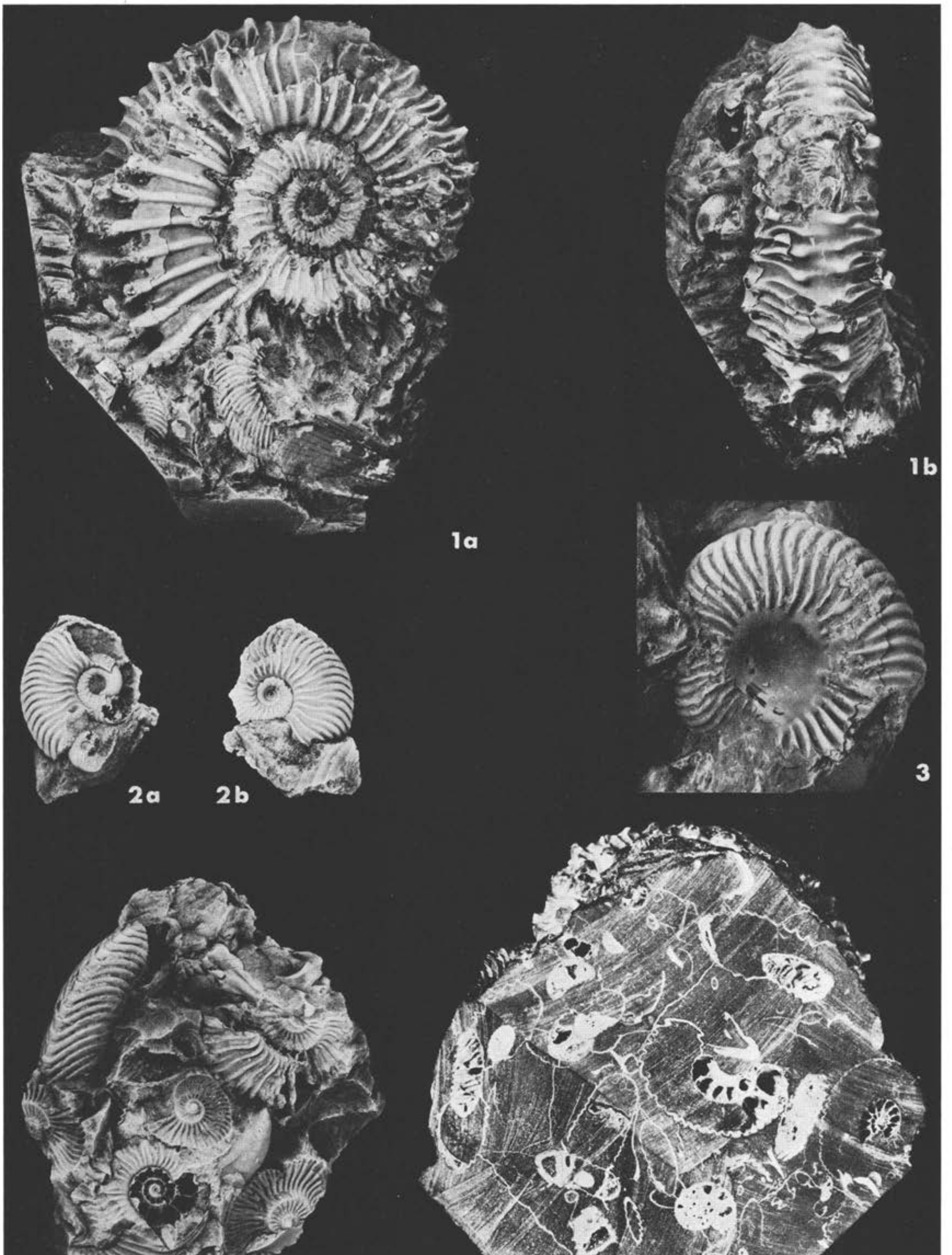
Plate III

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2b
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Plate V