



**Revision of Silurian Nautiloid Cephalopods from the Carnic Alps (Austria)  
– The HERITSCH (1929) Collection in the Geological Survey of Austria**

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3 text – figures, 7 plates and 1 table



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North Gondwanan Mid-Palaeozoic  
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**Contents**

Abstract	230
Zusammenfassung	230
1. Introduction	230
2. Previous Studies – Past and Present Links with Italy and Bohemia	231
3. Nautiloid Material Studied	233
3. 1. HERITSCH and STACHE Collections	233
3. 2. Stratigraphy of the Nautiloid localities	235
4. Palaeobiogeographical Implications of the Revised Nautiloid Fauna	235
5. Systematic Revision	235
5.1. Introductory note	235
5. 2. Systematics	235
Class CEPHALOPODA CUVIER, 1797	235
Subclass NAUTILOIDEA AGASSIZI, 1847	235
5.2.1. Order ORTHOCERIDA KUHN, 1940	235
5.2.1.1. Superfamily ORTHOCERATAEAE M'COY, 1844	235
5.2.1.2. Family ORTHOCERATIDAE M'COY, 1844	235
5.2.1.2.1. Subfamily MICHELINOCERATINAE FLOWER, 1945	335
Genus <i>Michelinoceras</i> FOERSTE, 1932	236
Genus <i>Merocycloceras</i> RISTEDT, 1968	242
Genus <i>Kopaninoceras</i> KISELEV, 1969	242
Genus <i>Plagiostomoceras</i> TEICHERT & GLENISTER, 1952	244
5.2.1.2.2. Subfamily KIONOCERATINAE HYATT <i>In</i> ZITTEL, 1900	246
Genus <i>Kionoceras</i> HYATT, 1884	246
Genus <i>Parakionoceras</i> FOERSTE, 1928	246
5.2.1.2.3. Subfamily LEUROCYCLOCERATINAE SWEET, 1964	246
Genus <i>Orthocycloceras</i> BARSKOV, 1972	246
5.2.1.2.4. Subfamily SPHAERORTHOCERATINAE RISTEDT, 1968	248
Genus <i>Hemicosmorthoceras</i> RISTEDT, 1968	248
5.2.1.3. Family ANASPYROCERATIDAE CHEN <i>In</i> CHEN, LIU & CHEN, 1981	248
Genus <i>Calorthoceras</i> CHEN <i>In</i> CHEN, LIU & CHEN, 1981	248
5.2.1.4. Family GEISONOCERATIDAE ZHURAVLEVA 1959	248
Genus <i>Geisonoceras</i> HYATT, 1884	248
Genus <i>Arionoceras</i> BARSKOV, 1966	250
Genus <i>Columenoceras</i> BARSKOV, 1960	250
5.2.1.5. Superfamily PSEUDORTHOCERATAEAE FLOWER & CASTER, 1935	252
5.2.1.6. Family PSEUDORTHOCERATIDAE FLOWER & CASTER, 1935	252
5.2.1.6.1. Subfamily SPYROCERATINAE SHIMIZU & OBATA, 1935	252
Genus <i>Pseudocycloceras</i> BARSKOV, 1959	252

5.2.2.	Order ONCOCERIDA FLOWER in FLOWER & KUMMEL, 1950	252
5.2.2.1.	Family ONCOCERATIDAE HYATT, 1884	252
	Genus <i>Oocerina</i> FOERSTE, 1926	252
5.2.3.	Order BARRANDEOCERIDA FLOWER in FLOWER & KUMMEL, 1950	255
5.2.3.1.	Family BARRANDEOCERATIDAE FOERSTE, 1925	255
	Genus <i>Barrandoceras</i> HYATT, 1884	255
5.2.3.2.	Family URANOCERATIDAE HYATT in ZITTEL, 1900	255
	Genus <i>Uranoceras</i> HYATT, 1884	255
5.2.3.3.	Family LECHRITROCHCERATIDAE FLOWER in FLOWER & KUMMEL, 1950	255
	Genus <i>Lechritrochoceras</i> FOERSTE, 1926	255
	Acknowledgements	255
	References	255

## Abstract

The nautiloid cephalopods described by HERITSCH (1929) from the Silurian of the Carnic Alps have been revised. This material was originally collected and prepared by STACHE in the seventies and eighties of the last century together with nautiloids from Dienten (Salzburg) however, it was never published by the latter. Seventeen genera and twenty species are represented in the collection from the Michelinoceratinae, Kionoceratinae, Leurocycloceratinae, Sphaerorthoceratinae, Anaspyroceratidae, Geisonoceratidae, Spyroceratinae, Oncoceratidae, Barrandoceratidae, Uranoceratidae and Lechritrochceratidae. The fauna show close affinities with both Bohemian and SW Sardinian nautiloid faunas thus adding to previous data from other fossil groups and from palaeomagnetic studies suggesting that during Silurian time the Carnic Alps together with the above North Gondwana terranes were geographically closer in position to Baltica than to Northern Africa.

## Revision der Nautiloideen–Fauna aus dem Silur der Karnischen Alpen (Österreich): Die Sammlung HERITSCH (1929) an der Geologischen Bundesanstalt

### Zusammenfassung

Die Nautiloideen aus dem Silur der Karnischen Alpen, die von HERITSCH (1929) beschrieben worden waren und jetzt größtenteils in den Sammlungen der Geologischen Bundesanstalt in Wien deponiert sind, wurden einer Revision unterzogen. Dieses Material, ursprünglich von STACHE in den Siebziger des vorigen Jahrhunderts zusammen mit Nautiloideen aus Dienten (Salzburg) aufgesammelt und präpariert, wurde jedoch von genanntem Autor nie publiziert.

17 Gattungen und 20 Arten aus den folgenden Subfamilien und Familien sind vertreten: Michelinoceratinae, Kionoceratinae, Leurocycloceratinae, Sphaerorthoceratinae, Anaspyroceratidae, Geisonoceratidae, Spyroceratinae, Oncoceratidae, Barrandoceratidae, Uranoceratidae und Lechritrochceratidae.

Die untersuchte Fauna zeigt enge Beziehungen zu den Nautiloideen Böhmens und SW Sardinien. Sie bestätigt somit Daten von anderen Fossilgruppen und von paläomagnetischen Studien, nach welchen die Karnischen Alpen in enger Nachbarschaft zu den obigen Nord–Gondwana – Mikrokontinenten liegen, die im Silur eine paläogeographische Position näher zu Baltica als zu Nordafrika einnahmen.

## 1. Introduction

The Silurian Cephalopod Limestone Biofacies is well developed in the Carnic Alps and has been famous since the last century for its abundance of macrofossils, particularly of nautiloid cephalopods. Hence the name "Orthoceras" limestone was widely used in the literature on the area (see section 2). In recent years a comprehensive study of these limestones has focused on obtaining data concerning the palaeogeographical setting of the Carnic Alps during the Silurian. This multidisciplinary study by an international working group includes a detailed investigation of the macrofauna (bivalves and nautiloids) and the microfacial changes within the conodont zones established on each of the sections examined (i.e. Cellon, Rauchkofelboden). A study of the taphonomic features of the limestone sequences primarily with regard to the nautiloid preservation but also including the associated fauna (HISTON, 1999; HISTON & SCHÖNLAUB, in press) has highlighted several interesting aspects of the limestone development at these localities which may be correlated across various sections indicating their relative positions within a subsiding basinal setting (SCHÖNLAUB, 1997). A sequence interpretation of the Llandovery – Ludlow succession of two sections (Cellon and Oberbuchach) in the Carnic Alps within the scope of this project has allowed a correlation with the Silurian of N. America (BRETT & SCHÖNLAUB, in SCHÖNLAUB,

1998). A comparison of the various palaeontological events and faunal and microfacial changes with those identified for other North Gondwana Silurian localities where the cephalopod limestone biofacies has been studied (GNOLI et al., 1980; FERRETTI & KRIZ, 1995) has been completed (FERRETTI & HISTON in prep.) and will add to the studies of the *Cardiola* levels by KRIZ in Montagne Noire (1996), Sardinia (1993), Carnic Alps (this volume) and Bohemia (1979).

The aim of the present study is to complement the other work on the Cephalopod Limestone Biofacies by revising existing nautiloid collections from the Carnic Alps thus establishing a precise faunal list for the Silurian. It is appropriate to redescribe the old collections under the new classification system based both on internal and external features. And thus use them to increase the list for the nautiloids within well defined stratigraphic horizons if possible. GNOLI & HISTON (1998) have described an extensive collection from the Italian Carnic Alps (Museo Friulano di Storia Naturale, Udine, Italy) and the collections of GORTANI (University of Bologna, Italy) have also been revised (GNOLI, HISTON & SERVENTI, in press). The HERITSCH (1929) collection housed in the Geological Survey of Austria (Vienna) is one of the few remaining published nautiloid faunas from the Carnic Alps in need of taxonomic revision. The present study allows the revised nautiloid species from the Carnic Alps to be used for precise correlation with the Sardinian and Bohemian faunas.

## 2. Previous Nautiloid Studies – Past and Present Links: Austria, Italy and Bohemia

There have been different phases of work on the “Orthoceras” limestones of the Carnic Alps: the middle to late nineteenth century during the original mapping campaign; the early part of this century during the twenties and thirties when great efforts were made to establish the stratigraphy of the Lower Palaeozoic sequences and tectonic setting of the area. A third phase in the late sixties and early seventies when micropalaeontological methods were employed to successfully establish the stratigraphy and facies changes and finally, a current revival of studies with regard to the palaeogeographical setting of the Carnic Alps during the Lower Palaeozoic has once again forged links between Czech geologists working on the classic Bohemian area, the Geological Survey of Austria (GBA) in Vienna working on the Austrian Carnic Alps and Italian geologists studying the Italian side of the Carnic Alps and the Lower Palaeozoic sequences from Sardinia.

The first to find fossils of Silurian age in Austria including orthoconic nautiloids was HAUER (1822–1899) during the original mapping of the area of Dienten, Salzburg (1847). STUR (1827–1893) noted nautiloids of Silurian age from Erzberg and Eisenerz in Styria (1865). The occurrence of “Orthoceras” limestones in the Silurian of the Austrian Carnic Alps was well documented by STACHE (1874, 1878, 1879, 1884) and FRECH (1887, 1894). However, most of these publications were again connected with the general mapping of these regions and the palaeontological data consisted principally of faunal lists.

The biostratigraphic potential of the nautiloid fauna from the Carnic Alps was proposed initially by SUSS (1858) after finds of brachiopod, trilobite and cephalopod fragments from the Silurian strata of the Carnic Alps which could be compared with the Bohemian fauna. In 1894 FRECH (1861–1917) suggested *Orthoceras potens* Barrande as an index fossil for the lower red “Orthoceras” limestones and *Orthoceras alticola* Barrande for the upper red “Orthoceras” limestones. Seven years before in 1887 he had described and illustrated these nautiloid species from that area. STACHE (1833–1921) assembled an extensive collection (see section 3.1.) while working in the Carnic Alps during the late nineteenth century.

BARRANDE’S (1799–1883) comprehensive work on the cephalopod fauna from the Silurian of Bohemia was also published in the second half of the nineteenth century and a complete set of these rare and expensive volumes was presented by the author with his personal dedication to “*L’Institut géologique impérial à Vienne, hommage de l’auteur*” (BARRANDE, frontispiece of the individual text and plate volumes, 1865–1877). Reviews of the cephalopod volumes of the *Système Silurien du centre de la Bohême* and of their significance for Austrian stratigraphy appeared in the “Verhandlungen der Geologische Bundesanstalt” series soon after the monographs were received from Barrande himself (HAUER, 1867; MOJSISOVICS, 1868, 1874). The books were already considered among the most precious of the acquisitions by the library of the “Geologische Reichsanstalt” by SENONER in 1854. A further donation of a representative collection of the Bohemian fauna (5200 specimens including 190 cephalopod species) ordered both stratigraphically and taxonomically was sent by BARRANDE to the museum of the “Geologische Reichsanstalt” (SCHLOENBACH, 1870). These studies in Bohemia greatly influenced the palaeontological investigations in the Lower Palaeozoic of Austria as correlation could now be made with the well defined stratigraphy of the Prague area using both the collection and publications so

generously given by the author to his colleagues from Austria. Fossil finds became essential in unravelling the complicated successions of the Alps by reference to the levels in which these taxa occurred in Bohemia. The connections between BARRANDE and his Austrian colleagues were further outlined by KÜPPER (1988).

Work on the Palaeozoic in Italy at this time was mainly by TARAMELLI (1845–1922) from the University of Pavia (1870, 1881, 1882, 1895) who was doing general mapping in the Carnic Alps but again the palaeontological aspect was minimal, some nautiloids were noted. He sent copies of his works to the “Geologische Reichsanstalt” in Vienna and stated that his stratigraphy was not as detailed as the Austrian one as his exposures were not as complete therefore he did not risk extrapolating their findings (1882, p. 41). In fact reviews of his earlier research in North Italy (HAUER, 1871; MOJSISOVICS, 1871; STACHE, 1873, 1874) were not favorable as it seemed that in some cases he was not familiar with the Austrian literature on the area and in others he misunderstood some of the conclusions that had been drawn. GEYER (1857–1936) reviewed his later works on the Carnic Alps in a less critical light (1896).

Many nautiloid specimens and new species were described from the Silurian of Sardinia by MENEGHINI (1811–1889) from the University of Pisa (1857). Some of these have later been shown by SERPAGLI & GNOLI (1977) and GNOLI & SERPAGLI (1977) to be synonymous with BARRANDE’S species who was working contemporaneously in Prague. MENEGHINI corresponded with the “Geologische Reichsanstalt” about his work in Sardinia and other parts of Italy which was highly regarded by his Austrian colleagues (MENEGHINI, “Todes Anzeigen” obituary, 1889).

In the last decade of the nineteenth and in the early years of the twentieth century, mapping for the “Geologische Reichsanstalt” was continued in the Carnic Alps by GEYER (1894, 1895, 1897, 1899, 1903) who collected some nautiloid material during his fieldwork although he never formally described it. Meanwhile GORTANI (1883–1966) from the University of Bologna and VINASSA DE REGNY (1871–1957) from the University of Pavia (both of whom had come under the influence of TARAMELLI) produced the most important Italian works on the area in which the ‘*Orthoceras*’ limestones are mentioned in detail and a total of 18 nautiloid species were described by both the latter researchers (1905, 1909, 1908, 1910 various, 1913 various, 1924, 1925 various, 1926). Correlation was again attempted with the Bohemian fauna and reference was made to the work done in Austria by STACHE and GEYER. GORTANI & VINASSA DE REGNY (1909, p. 184) awaited the eventual publication of the systematic work by STACHE outlined as being in preparation in 1890 (see section 3. 1.). Notes on the Italian findings were published by the authors in the “Verhandlungen” series of the “Geologische Reichsanstalt” (1914) as were reviews by GEYER (1897, 1899, 1903, 1905, 1906, 1910) of their and many other Italian publications on the Lower Palaeozoic of the Carnic Alps. Reference to each other’s work was always favorable.

STACHE still retained his interest in the Silurian of the Carnic Alps and in GEYER’S work and visited him in the field (STACHE, 1895, p. 19). GEYER (1894) obtained a travel grant on the recommendation of STACHE, who was then Director of the “Geologische Reichsanstalt”, from the “Dr Urban Schlönbach–Reisestipendien–Stiftung” (STACHE, 1895, p. 26) to visit the Prague area in order to study the classic Silurian localities. This was deemed necessary by the Director for the exact stratigraphic determination of the Alpine sequences. JAHN (1892) who had worked in that region accompanied him to the famous Barrandian localities. GEYER kept a detailed

fieldbook during these excursions with accurate sketches of each of the sections seen (GBA Archives: A00074–TB). A lot of work that was done in these early years in Austria and Italy was in preparation for the International Geological Congresses held in Bologna (1881) and in Vienna (1903).

It was not until the late twenties/early thirties of this century when an interest in establishing the stratigraphy of the Lower Palaeozoic sequences and tectonic setting of the Carnic Alps arose that more detailed investigations were carried out. GORTANI and VINASSA DE REGNY still continued to work on the Italian sections of the Alps and also in Sardinia (GORTANI, 1923) while HERITSCH (1882–1945) from the University of Graz and VON GAERTNER (1906–1982) from the University of Göttingen examined the Austrian sections. In 1931 VON GAERTNER published a comprehensive study of the Central Carnic Alps which included faunal lists for the stratigraphic divisions he had used and an interpretation of the tectonic setting. As GEYER had done before him he visited the classic Silurian localities of Bohemia before completion of his work in order to make comparative studies. BOUCEK (1904–1975) was working on the Silurian in Bohemia at that time (1931, 1934) and accompanied VON GAERTNER to many localities answering in detail questions on the Silurian (VON GAERTNER 1931, "Vorwort"). Several of BARRANDE'S nautiloid species were listed from the Cellon (VON GAERTNER, 1931, p.130) and Rauchkofel Boden (VON GAERTNER, 1931, p. 137) sections which were used for correlation with the Bohemian fauna.

As may be seen from the studies outlined above the main focus of the early work in the areas in question, apart from BARRANDE, was not of a systematic nature but consisted of fossil taxa described or noted for their stratigraphic implications. The only systematic work on nautiloids from the Austrian Carnic Alps was done by HERITSCH (1929) who described some of the earlier collected material from Dienten, Salzburg (Hauer, 1847) and Kokberg (Mt. Cocco), Carnic Alps (STACHE, 1890) giving clear stratigraphic data for the published species (see section 3.1.). HERITSCH also visited the Silurian localities of Bohemia for comparative studies and was accompanied on these excursions by the Czech geologists KETTNER, KODYM and KOLIHA the latter of whom also helped him with his study of BARRANDE'S collection in the Museum of Prague (HERITSCH, 1929, "Vorwort").

In 1943 HERITSCH proposed the following zonation using nautiloids for the Silurian of the Carnic Alps:

<i>Orthoceras apollo</i> BARRANDE	– Kok Limestone
<i>Orthoceras electum</i> BARRANDE	– Kok & Alticola Limestone
<i>Orthoceras neptunium</i> BARRANDE	– Alticola Limestone

However, he stated that it is difficult to define zones based on the nautiloid fauna as most species are found in both the Kok and Alticola Limestones. He listed a total of 52 species mainly of the genus *Orthoceras* but also some *Cyrtoceras*, *Trochoceras* and *Barrandeoceras* species which had been described by himself (1929) and listed by earlier workers, giving as much stratigraphic data as was available. This work was included in his unpublished volume on the Alps (1943) for its stratigraphic implications and the nautiloid fauna was not redescribed systematically although in some cases he revised the generic assignment of some species within the lists given.

A third phase of renewed study in the Austrian Carnic Alps was started at the beginning of the sixties by FLÜGEL (1965), again from the University of Graz, looking at microfacial changes in the Lower Palaeozoic sequences. His work was followed by the application of micropalaeontological investigations by WALLISER also from Göttingen (1957, 1964) and

SCHÖNLAUB (a former student of FLÜGEL from the University of Graz) from the Geological Survey of Austria in Vienna (1970, 1971, 1979, 1980) towards a more refined stratigraphy based on conodont zonation. In the Italian Carnic Alps research was also begun by VAI from the University of Bologna on a more refined stratigraphy and the tectonic setting of the area (1963, 1967, 1971, 1976).

In Bohemia stratigraphic studies were also continued with particular emphasis on conodonts, graptolites and bivalves. Cooperation between SCHÖNLAUB of the Geological Survey (Vienna) for conodonts, KRIZ of the Czech Geological Survey for bivalves and JAEGER (1929–1992) of the Museum "für Naturkunde der Humboldt–Universität", Berlin for graptolites gave rise to a series of important papers on the Silurian sections of the Prague Basin and the Carnic Alps with refined stratigraphies using all three fossil groups: KŘIŽ, 1979; KŘIŽ et al., 1986, 1993; JAEGER, 1975, 1978; JAEGER & SCHÖNLAUB, 1994). A short outline of the cooperation for Lower Palaeozoic research between Austrian and Czech geologists during this period is given by KRIZ (1990).

Around the time of this renewed interest in the area RISTEDT (1968, 1969, 1971) from the University of Bonn included material from the Cellon and Rauchkofelboden sections of the Austrian side of the Carnic Alps in his study of early ontogenetic features in orthoconic nautiloids. He described twelve new species from the Silurian however, these papers were more concerned with the examination of the morphology than with a systematic description of the nautiloid fauna. RISTEDT (1969), based on his own collections and research, suggested that the following of his described species may be useful as marker fossils as they are found as mass occurrences at these horizons in the Carnic Alps:

<i>Merocycloceras declivis</i>	– upper Wenlock/Lower Ludlow
<i>Hemicosmothoceras celloni</i>	– Base of the Cardiola Formation
<i>Hemicosmothoceras laterculum</i>	– Base Megaerella Limestone

The nautiloid fauna of the classic Silurian localities in Bohemia and BARRANDE'S type collection have been studied by HORNY (1956), MAREK (1971), TUREK (1975) and KOLEBABA (1977). Various papers by SERPAGLI & GNOLI (1977) and by GNOLI (1980, 1983, 1987, 1990) on the Lower Palaeozoic nautiloid fauna of SW Sardinia have been complemented by conodont studies therefore the nautiloid occurrences are stratigraphically well defined and can be compared with the studies from Bohemia, both those of BARRANDE and the more recent ones outlined above. Research in both Bohemia and Sardinia by all of the aforementioned authors is still ongoing and correlation of the faunas has been attempted through close cooperation between both research communities.

Recent investigations of the Cephalopod Limestone biofacies in Bohemia (FERRETTI & KRIZ, 1995) and in Sardinia (GNOLI et al., 1980) prompted a multidisciplinary study coordinated by SCHÖNLAUB (present Director of the Geological Survey of Austria) of this facies in the Austrian Carnic Alps (see section 1. Introduction). Once again vital cooperation is successfully taking place between geologists from Prague working on the classic Barrandian (KRIZ for bivalves; MANDA, TUREK, KOLEBABA for nautiloids), from the GBA in Vienna working on the Austrian Carnic Alps (SCHÖNLAUB for conodonts; HISTON for nautiloids), from the Museum of Udine (MUSCIO & SIMONETTO – Palaeozoic collections) and University of Bologna (SPALLETTA et al. 1982, 1989; PERRI & SPALLETTA, 1998 – Lower Palaeozoic stratigraphy) working on the Italian Carnic Alps and from the University of Modena working on the Italian and Austrian Carnic Alps and Sardinia (FERRETTI for conodonts and microfacies; SERPAGLI for conodonts; GNOLI &

SERVENTI for nautiloids). Nowadays travel by researchers to other countries has become easier and most of the geologists mentioned have visited the other's localities frequently for comparative studies.

As a consequence of the present work on the Cephalopod Limestone Biofacies in the Carnic Alps the published nautiloid fauna is being systematically revised and new collections are being compiled from stratigraphically well defined sections.

HISTON (1997) reproduced the nautiloid faunal list of HERITSCH (1943) giving where possible tentative generic revisions of some of the species. GNOLI & HISTON (1998) systematically described 18 species from a museum collection of material from the Silurian of the Italian Carnic Alps. HISTON (1998) gave a comprehensive list of all the published nautiloid species from the Silurian of the Carnic Alps which included 75 documented taxa. The nautiloid species described by GORTANI & VINASSA DE REGNY (1909) have also been systematically re-described and illustrated (GNOLI, HISTON & SERVENTI, in press). BOGOLOPOVA (1998) published a faunal list of 22 species from particular stratigraphic horizons in the Silurian of the Cellon and Rauchkofel Boden sections of the Austrian Carnic Alps. The present study of the HERITSCH (1929) collection will complete the revision of published nautiloid species therefore future work may be concentrated on newly collected material which of course will require the continued close cooperation between Czech, Austrian and Italian researchers maintaining the tradition began by BARRANDE, STACHE and MENEGHINI.

### 3. Nautiloid Material Studied

#### 3.1 HERITSCH and STACHE Collections

STACHE (Fig. 1) collected a large amount of fossil material from the Silurian strata of Kokberg (Mt. Cocco) in the Carnic Alps. He had mapped the area extensively during the eighteen seventies and had noted the particular abundance of Silurian fauna from the "Orthoceras limestones" of this locality (1878, 1879, 1884). He prepared this material for a monograph of the "Abhandlungen" series of the "Geologische Reichsanstalt", Vol. XVI – *Die Silur Faunen der Ostalpen*. He published a detailed outline of what he intended to include in the monograph in 1890: "The Silurian faunas from Dienten near Salzburg and from Kokberg in the Carnic Alps". The outline was almost six pages in length and included the proposed layout of the text in three major divisions:

- 1) The Dienten fauna which contained material collected by HAUER (1847) and by STACHE himself. Three plates would illustrate this material, the proofs of two of these were already printed. The fauna from Kokberg would occupy 15 plates, seven of which were already prepared.

- 2) The fauna from Uggwa Valley both from the graptolitic shales and from the (Ordovician) "Strophomena" – levels. Two plates would illustrate the first fauna which were already in press and 5–6 plates the second fauna three of which were prepared for printing.

- 3) The palaeontological conclusions and stratigraphic data for the fauna together with maps and cross-sections of the localities.

He then gave the historical background to the Dienten fauna in his outline together with species identifications and correlation with the horizons in which they occur in Bohemia. He mentioned a similar account for the Kokberg fauna and stated the number of plates that would be dedicated to each fossil group: for example 4 plates for the cephalopod fauna from Kokberg with three reserved only for "Orthoceras" forms.



Text-Fig. 1:  
Guido STACHE (1833–1921). Courtesy of the GBA archives:  
A07127-B

STACHE was extremely interested in the use of fossils for stratigraphy and was very familiar with the Silurian fauna from Bohemia. He gave an up to date account of occurrences of Silurian taxa throughout Austria (1879) and attempted to correlate some of these faunas with those of Thuringia and England as well as with Bohemia (1884).

He was then appointed director of the "Geologische Reichsanstalt" in 1893 and obviously could not maintain his schedule of work on the planned monograph. Volume XV of the "Abhandlungen" series was published between 1889–1893. A mention of the planned publication of STACHE's monograph (Vol. XVI) appears in 1895 under the notices of the "Geologische Reichsanstalt" publications (STACHE, 1895, "Druckschriften", p.43) and again in 1897 (STACHE, "Druckschriften", p. 50) stating 1898 or 1899 as a possible date of issue. In 1900 under the publication notices (STACHE, "Druckschriften", p. 27) the reserved "Abhandlungen" number XVI for the Alpine Palaeozoic volume was assigned to SCHELLWIEN for the Permo-Carboniferous Fauna of the Southern Alps. STACHE had obviously resigned himself to the fact that he would not be able to complete the monograph due to his heavy schedule of duties as Director and had surrendered the "Abhandlungen" volume reserved for that work. He retired at the age of 70 in 1903 and never completed his monograph on the Silurian Fauna. He died in 1921.

Quite a number of the plates he produced still exist in the GBA collections particularly those he prepared for the cephalopod fauna. These are illustrated here in Pls. 4–7 and represent three of his original plates of the Kokberg fauna (STACHE, Pls VIII–X) and one of the Dienten fauna (STACHE, Pl. II). A fifth plate (STACHE, Pl. VII) has not been found ho-



Text-Fig. 2: Franz HERITSCH (1882–1945). Reproduced from FLÜGEL (1977, Fig. 7).

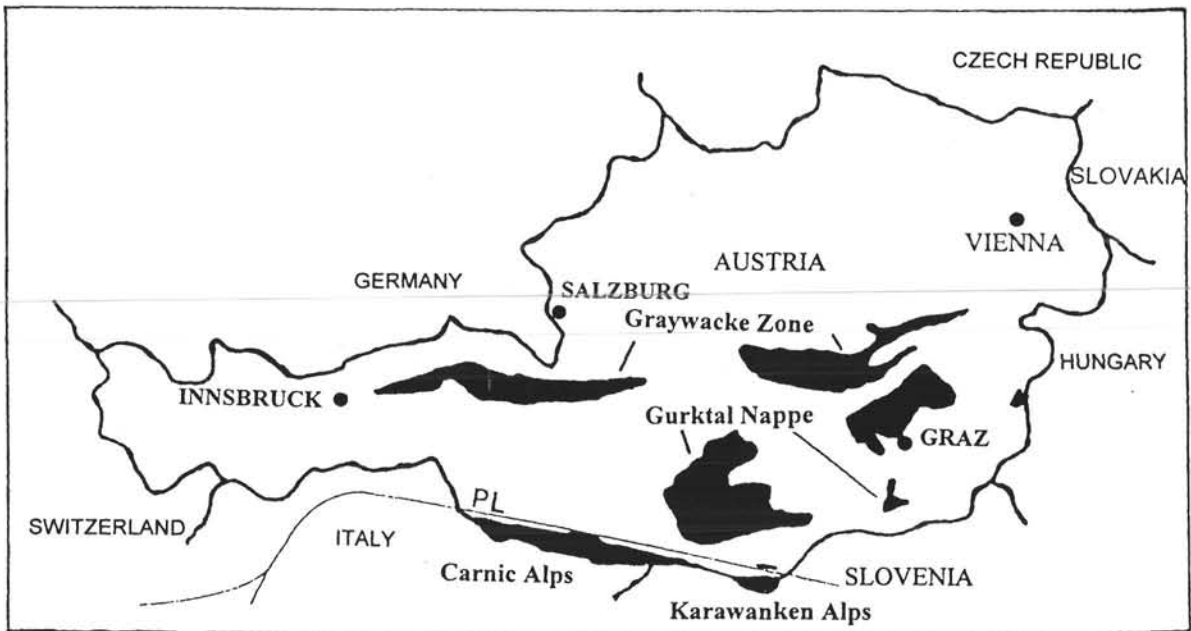
wever, individual figures cut out from it are contained in the boxes of the specimens which they illustrated. The figures are numbered and there must have been at least twenty one figured specimens as this was the highest figure number at-

tained. Not all of the intervening numbered figures or specimens have been located (refer to Table 1).

HERITSCH (Fig. 2) published a monograph of the "Abhandlungen" series of the "Geologische Bundesanstalt" in 1929 (Vol. XXIII, part 2) on the "*Faunen aus dem Silur der Ostalpen*". In the "Vorwort" he stated that the bulk of the material described was from the STACHE and GEYER field collections in the Geological Survey of Austria (Vienna). Other material was personally collected by him and his colleague VON GAERTNER. He also stated that he had used some of STACHE'S figures in compiling the plates for his monograph and had followed some of STACHE'S species determinations which he found as hand written notes with the specimens themselves (1929, "Vorwort").

During the present revision of the nautiloid fauna of the HERITSCH (1929) collection approximately one hundred specimens were studied. The majority of the specimens figured by HERITSCH (Pls 1–3 in the present revision are reproductions of HERITSCH, 1929, Pls V–VII) have been located as have the specimens figured by STACHE in his unpublished plates (Table 1). In total seven specimens from STACHE'S unpublished plates (equivalent to 15 figures) and eight specimens (equivalent to 12 figures) from the HERITSCH (1929) plates were not found. As HERITSCH reproduced almost all of STACHE'S figures of the nautiloid fauna (Table 1) in reality a total of 12 specimens (equivalent to 12 figures) are missing from the type collections.

The boxes in which the type material is stored in most cases also contain four labels or accompanying notes with a wealth of systematic information: 1) Label from the "Geologische Bundesanstalt" with the specimen number (old series – refer to Table 1), the species identification of the specimen, locality data, figure reference to HERITSCH (1929), figure reference to STACHE (unpublished), GBA repository museum cabinet number (old series); 2) label from the "Geologische Reichsanstalt" or "Sammlungen der Reichsanstalt für Bodenforschung" with the species determination, locality data and figure reference to STACHE (unpublished); 3) STACHE'S figure of that specimen cut out from the corresponding unpublished plate; 4) hand written note with species determi-



Text-Fig. 3: Locality Map showing the position of the Carnic Alps traversing the Austrian/Italian border and Salzburg to the west near the German Border.

nation and the corresponding plate and figure number to which the specimen had been compared if the species had been described by BARRANDE – this was almost certainly written by STACHE.

HERITSCH (1929) apparently followed STACHE'S outline for text and figures (1890) for the monograph of the Silurian Fauna and certainly, as far as the nautiloid fauna are concerned, reproduced most of STACHE'S figures and species determinations which had been based by STACHE himself on BARRANDE'S work on Bohemia.

### 3. 2. Stratigraphy of the Nautiloid localities

The nautiloid specimens studied in this work are mainly from one locality, Kokberg (Mt. Cocco) on the now Italian side of the Carnic Alps (Fig. 3). Three horizons are represented: "Roter Kalk" (red limestone), "Schwarzer Kalk" (black micritic limestone), "Schwarzer Schiefer" (black shale). The red limestone is probably middle Silurian in age according to details from HERITSCH (1929) and from bivalve studies by KRIZ (1979). The precise stratigraphic level from which the fossil material was collected within these limestones is not known. Recent work by HERZOG (1988) on the exposed sections of Kokberg implies that the lower and upper Kok Limestones belong to the *sagitta* – *plöckensis* conodont biozones indicating a Wenlock/Ludlow age. The black limestone is indicated as Wenlock.

The stratigraphy of the Cellon (Cellonetta is the old name) section from which some of the examined material has been derived is well established since the work of WALLISER (1964) and the following ages for the horizons containing the nautiloid material in the collection may be dated as Cardiola Niveau: Ludlow, Roter Kalk: Wenlock?, and untermes Silur: Llandovery/Wenlock.

The material from the Roter Kalk horizon of Kellerwand and Rauchkofel Boden may also be Wenlock in age while the red limestone from the locality "Oberes Valentintal" is dated as Ludlow. The horizon of the "Würmlacher Alpe" is not known. The graphitic shales (Schiefer) from Dienten near Salzburg in the Graywacke Zone (Fig. 3) are given as Ludlow by SCHÖNLAUB (1979).

### 4. Palaeobiogeographical Implications of the Revised Nautiloid Fauna

The most current synthesis of the palaeogeographical position of the Carnic Alps during the Lower Palaeozoic has been given by SCHÖNLAUB (1997, 1998) which suggests an on-going drift towards lower latitudes and a palaeolatitudinal position between 30 and 40° S during the Silurian. This is concluded from evidence for faunal/floral affinities of conodonts (SCHÖNLAUB, 1980, WALLISER, 1964), acritarchs (PRIEWALDER, 1987), chitinozoa (PRIEWALDER, 1997), bivalves (KRIZ, 1979 and this volume), trilobites and brachiopods which demonstrate closer links with Baltica and Avalonia than with Africa and southern Europe (i.e. North Gondwana). Palaeomagnetic studies (SCHATZ et al., 1997; TAIT et al., 1999) support these conclusions. A multidisciplinary study on the Silurian Cephalopod Limestone Biofacies in the Carnic Alps (FERRETTI & HISTON, 1997, 1998) has highlighted the presence of climatic sensitive indicators such as corals, bryozoans, stromatolites and iron ooid levels indicating a moderately warm climate.

SERPAGLI & GNOLI (1977) and GNOLI (1990) have shown links between the Sardinian and Bohemian nautiloid faunas

while GNOLI & HISTON (1998) have suggested close relationships between the nautiloids of the Carnic Alps and both the latter areas. The present study adds more data to support the idea of faunal exchange between these North Gondwana terranes and Baltica.

As the stratigraphic data for the localities of the HERITSCH (1929) collection are quite poor the precise levels from which the fauna originate are not known therefore it is impossible to comment on its distribution within biozones but only within the broad spectrum of the Silurian.

However, it should be noted that the fauna has distinct morphological elements with minor (sometimes only single) representatives of *Lechritrochoceras*, *Oocerina*, *Barrandeoceras* and *Uranoceras* which were probably more restricted in their environment than the more longiconic orthocones which represent the bulk of the fauna.

All the species described here are also known from Bohemia while only the orthoconic forms are documented from Sardinia. Material has also been compared in this study to certain species which only occur in Bohemia. Some species show a greater distribution being recorded from the Urals and middle Asia. Others have also been noted from Morocco, France, Spain, Podolia and China. This may be a factor of lack of up to date systematic revisions from many areas but the presence of the more facies restricted species possibly reflects the closeness of the Carnic Alps to Bohemia where these forms are common in the Ludlow/Pridoli series (MAREK & TUREK, 1986) while the more pelagic faunas reflect the exchange between the various North Gondwana terranes, Baltica and the Urals due to currents.

## 5. SYSTEMATICS

### 5.1. Introductory Note

The higher taxonomic classification system of the Treatise (MOORE, 1964) has been followed where possible with modifications from more recent systematic works when appropriate. Synonymies include only systematic descriptions of the species in question or where new generic assignments have been cited. As HERITSCH (1929) described the material in adequate detail it was considered unnecessary to repeat the morphological dimensions here. Additional notes are given to account for the revised classification of the specimens. Internal features are rarely seen due to recrystallisation or the fragmentary nature of the specimens. The reference from HERITSCH (1929) to the material presently revised is included under the synonymy of that new species determination and in Table 1. The illustrations of the specimens are reproduced from HERITSCH (1929, Pls V–VII) and from unpublished plates by STACHE (Pls II, VIII–X). STACHE'S unpublished plate VII was not located in its complete form so is not reproduced here. A lot of the material from the collection was too badly preserved to be identified and is here included only in Table 1 as indeterminate orthocones or cytocones but is not included below under the systematic descriptions.

### 5. 2. Systematics

Class CEPHALOPODA CUVIER, 1797

Subclass NAUTILOIDEA AGASSIZI, 1847

5.2.1. Order ORTHOCERIDA KUHN, 1940

5.2.1.1. SUPERFAMILY ORTHOCERATAEAE M'COY, 1844

5.2.1.2. Family ORTHOCERATIDAE M'COY, 1844

5.2.1.2.1 Subfamily MICHELINOCERATINAE FLOWER, 1945

Genus *Michelinoceras* FOERSTE, 1932

Type-species: By original designation *Orthoceras michelini* (BARRANDE, 1866)

***Michelinoceras currens* (BARRANDE, 1866)**

(Pls 2, 5, 7: HERITSCH, Pl. VI, Figs. 632–637; STACHE, Pl. VIII, Figs. 7, 7a; Pl. X, Figs. 16, 16a)

- 1860 *Orthoceras currens*. – BARRANDE, 624 (*nomen nudum*).  
1866 *Orthoceras currens*. – BARRANDE, Pl. 221, Pl. 222.  
1870 *Orthoceras currens*. – BARRANDE, Pl. 407, Pl. 411  
1874 *Orthoceras currens*. – BARRANDE, 628.  
1929 *Orthoceras currens* BARRANDE – HERITSCH, 69–70, Figs. 632–633, 635–636.  
1929 *Orthoceras* cf. *currens* BARRANDE – HERITSCH, 70, Figs. 634, 637.  
1962 *Michelinoceras currens* (BARRANDE) – FLOWER, 10.  
1972 *Michelinoceras currens* (BARRANDE) – BARSKOV, 36, Pl. 1, Fig. 5, Pl. 2, Fig. 5.  
1977 *Michelinoceras currens* (BARRANDE) – SERPAGLI & GNOLI, 161–162, Pl. 2, Fig. 6.

Description: As given by HERITSCH (1929).

Remarks: The slender conch, narrow siphuncle and chamber length allow the specimens to be assigned to *Michelinoceras currens* (BARRANDE).

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Occurrence outside the Carnic Alps: Upper Silurian of SW Sardinia, Bohemia and Middle Asia.

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/177; GBA 1929/1/178.

***Michelinoceras* cf. *currens* (BARRANDE, 1866)**

(Pls 2, 7: HERITSCH, Pl. VI, Figs. 649–652; STACHE, Pl. X, Figs. 15, 15a, 15a, 15b)

- 1929 *Orthoceras* cf. *praevalens* BARRANDE – HERITSCH, 57–58, Figs. 649–652.

Description: As given by HERITSCH (1929).

Remarks: The specimens do not possess the characters of the species to which they were assigned by HERITSCH (1929) particularly in the ornament of the conch. They are compared here with *Michelinoceras currens* (BARRANDE) on the basis of the chamber length and expansion angle of the conch.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologischen Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/147; GBA 1929/1/147a.

***Michelinoceras* cf. *michelini* (BARRANDE, 1866)**

(Pls 2, 5, 7: HERITSCH, Pl. VI, Figs. 618–620, 658–661; STACHE, Pl. VIII, Figs. 6, 6a; Pl. X, Figs. 18–20)

- 1929 *Orthoceras accuarium* MÜNSTER – HERITSCH, 69, Figs. 618–620.  
1929 *Orthoceras* cf. *perlongum* BARRANDE – HERITSCH, 66, Figs. 658–661.

Description: As given by HERITSCH (1929).

Remarks: The specimens do not possess the characters of the species to which they were assigned by HERITSCH (1929). The slender conch, long chambers and distinctive small siphon allow them to be compared with *Michelinoceras michelini* BARRANDE.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Four specimens – GBA 1929/1/175; GBA 1929/1/168; GBA 1929/1/168a; GBA 1929/1/168b.

***Michelinoceras* ? cf. *migrans* (BARRANDE, 1866)**

(Pls 3, 7: HERITSCH, Pl. VII, Figs. 714–715; STACHE, Pl. X, Fig. 7)

- 1929 *Orthoceras migrans* BARRANDE – HERITSCH, 70, Figs. 714, 715.

Description: As given by HERITSCH (1929).

Remarks: The specimen has been assigned to the genus *Michelinoceras* with some doubt on the basis of chamber length, small siphon and ornament and is compared to *Orthoceras migrans* BARRANDE. This species has been assigned to *Temperoceras* Barskov (BARSKOV, 1972) however, the studied specimen resembles more *Michelinoceras* Foerste than the latter genus.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/181.

***Michelinoceras* sp.**

(Pls 3, 7: HERITSCH, Pl. VII, Figs. 702–703; STACHE, Pl. X, Fig. 13)

- 1929 *Orthoceras* cf. *firmum* BARRANDE – HERITSCH, 66, Figs. 702, 703.

Description: As given by HERITSCH (1929).

Remarks: The specimen is assigned to this genus on the basis of the slender conch and long chambers even if the diagnostic siphuncle is not visible.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/167.

Table 1a–e

The systematic data of the specimens figured by HERITSCH (1929) and STACHE (unpublished) is summarised under the following headings: 1) HERITSCH – figures numbered consecutively as they appear on his plates V–VII. The majority of these figures are reproduced from STACHE'S unpublished plates and are so indicated in the Table. Specimens not to natural size are marked by an asterisk \*; 2) STACHE – unpublished plates and figures not numbered consecutively. Those figures that were later reproduced by HERITSCH correspond with the latter's figure numbers in column 1 (see above). In some cases HERITSCH did not reproduce all of STACHE'S unpublished figures of the material he described, these are listed together with the reproduced figures. Other unpublished material is listed at the end of the Table after that described by HERITSCH. Specimens not to natural size are marked by an asterisk \*; 3) Page numbers of HERITSCH (1929) where the material is described; 4) Geologische Bundesanstalt (GBA) collection numbers both of the old and new series for the material figured. Some of the figured specimens were not located in the GBA collections and are presumed lost. Other figures were reproduced from works by BARRANDE and FRECH. One specimen is housed in the collections of the Palaeontology Dept., University of Graz (UGP); 5) The original specific determination of the figured material by HERITSCH (1929); 6) The revised specific determination given in the present study; 7) The locality from which the material was collected; 8) The stratigraphic horizon from which the material was collected (HERITSCH, 1929) and where known, its present stratigraphic level.



1	2	3	4	5	6	7	8
Heritsch - figure	Stache - plate & figure	Heritsch	GBA Collection Number	Original designation - Heritsch 1929	Revised status	Locality	Horizon
2	Unpublished	Text					
3							
4	58 - 59	116	UGP 1384 - not seen	<i>Orthoceras</i> sp.	<i>Indeterminate orthocone</i> ?	Cellonetta	Unter Silur
5	562 - reproduced Stache	II - 10a	21 1929 / 1 / 26 (old 3732)	<i>Orthoceras dorulites</i> Barrande	<i>Parakionoceras</i> sp.	Dienten	Schiefer (Ludlow)
6	563 - reproduced Stache	II - 10b	21 1929 / 1 / 26a (old 3732)	<i>Orthoceras dorulites</i> Barrande	<i>Parakionoceras</i> sp.	Dienten	Schiefer (Ludlow)
7	564 - reproduced Stache*	II - 10c	21 1929 / 1 / 26a (old 3732)	<i>Orthoceras dorulites</i> Barrande	<i>Parakionoceras</i> sp.	Dienten	Schiefer (Ludlow)
8	565 - reproduced Stache	II - 10d	21 1929 / 1 / 26a (old 3732)	<i>Orthoceras dorulites</i> Barrande	<i>Parakionoceras</i> sp.	Dienten	Schiefer (Ludlow)
9	566 - reproduced Stache	II - 10e (from Barrande)	21 Barrande collection	<i>Orthoceras dorulites</i> Barrande	<i>Orthoceras dorulites</i> , Barrande pl. 268, fig. 12		
10	567 - reproduced Stache*	II - 10f (from Barrande)	21 Barrande collection	<i>Orthoceras dorulites</i> Barrande	<i>Orthoceras dorulites</i> , Barrande pl. 268, fig. 16		
11	568 - reproduced Stache	II - 10g (from Barrande)	21 Barrande collection	<i>Orthoceras dorulites</i> Barrande	<i>Orthoceras dorulites</i> , Barrande pl. 268, fig. 17		
12	569 - reproduced Stache	II - 12	23 1929 / 1 / 32 (old 3732)	<i>Orthoceras semissecans</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
13	570 - reproduced Stache	II - 12a	23 1929 / 1 / 32 (old 3732)	<i>Orthoceras semissecans</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
14	571 - reproduced Stache	II - 12b	23 1929 / 1 / 32 (old 3732)	<i>Orthoceras semissecans</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
15	572 - reproduced Stache	II - 15	21 1929 / 1 / 27 (old 3726)	<i>Orthoceras aff. carminatum</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
16	573 - reproduced Stache	II - 15b	21 1929 / 1 / 27 (old 3726)	<i>Orthoceras aff. carminatum</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
17	574 - reproduced Stache*	II - 15a	21 1929 / 1 / 27 (old 3726)	<i>Orthoceras aff. carminatum</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
18	575 - reproduced Stache	II - 17	23 - 24 1929 / 1 / 33 (old 3722)	<i>Orthoceras novellum</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
19	576 - reproduced Stache*	II - 17a	23 - 24 1929 / 1 / 33 (old 3722)	<i>Orthoceras novellum</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
20	577 - reproduced Stache	II - 17b	23 - 24 1929 / 1 / 33 (old 3722)	<i>Orthoceras novellum</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
21	578 - reproduced Stache	II - 18	21 1929 / 1 / 25 (old 3721)	<i>Orthoceras conoideum</i> Münster	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
22	579 - reproduced Stache	II - 18a	21 1929 / 1 / 25 (old 3721)	<i>Orthoceras conoideum</i> Münster	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
23	580 - reproduced Stache*	II - 18b	21 1929 / 1 / 25 (old 3721)	<i>Orthoceras conoideum</i> Münster	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
24	581 - reproduced Stache	II - 19	21 1929 / 1 / 24 (old 3725)	<i>Orthoceras alternans</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
25	582 - reproduced Stache	II - 19a	21 1929 / 1 / 24 (old 3725)	<i>Orthoceras alternans</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
26	583 - reproduced Stache*	II - 19b	21 1929 / 1 / 24 (old 3725)	<i>Orthoceras alternans</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
27	584 - reproduced Stache	II - 20	20 1929 / 1 / 23 (old 3737)	<i>Orthoceras cuneus</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
28	585 - reproduced Stache	II - 20a	20 1929 / 1 / 23 (old 3737)	<i>Orthoceras cuneus</i> Barrande	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
29	586 - reproduced Stache	II - 21	22 1929 / 1 / 29 (old 3728)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Dienten	Schiefer (Ludlow)
30	587 - reproduced Stache	II - 21a	22 1929 / 1 / 29 (old 3728)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Dienten	Schiefer (Ludlow)
31	588		61 1929 / 1 / 153	<i>Orthoceras amoenum</i> Barrande	<i>Pseudocyloceras</i> cf. <i>transiens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
32	589 - reproduced Stache	VIII - 12	61 1929 / 1 / 153	<i>Orthoceras amoenum</i> Barrande	<i>Pseudocyloceras</i> cf. <i>transiens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
33		VIII - 12a	61 1929 / 1 / 153	<i>Orthoceras amoenum</i> Barrande	<i>Pseudocyloceras</i> cf. <i>transiens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
34		VIII - 12b	61 1929 / 1 / 153	<i>Orthoceras amoenum</i> Barrande	<i>Pseudocyloceras</i> cf. <i>transiens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
35	590 - reproduced Stache	VIII - 12c	61 1929 / 1 / 153	<i>Orthoceras amoenum</i> Barrande	<i>Pseudocyloceras</i> cf. <i>transiens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
36		VIII - 12d	61 1929 / 1 / 153	<i>Orthoceras amoenum</i> Barrande	<i>Pseudocyloceras</i> cf. <i>transiens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
37	591		61 1929 / 1 / 154 (old 5007)	<i>Orthoceras aff. amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
38	592		61 1929 / 1 / 153 (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
39	593 - reproduced Stache	VIII - 9	61 1929 / 1 / 153a (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
40		VIII - 9a	61 1929 / 1 / 153a (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
41		VIII - 9b	61 1929 / 1 / 153a (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
42		VIII - 9c	61 1929 / 1 / 153a (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
43	594 - reproduced Stache	VIII - 10	61 1929 / 1 / 153b (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
44	595 - reproduced Stache*	VIII - 10a	61 1929 / 1 / 153b (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
45	596 - reproduced Stache	VIII - 11	61 1929 / 1 / 153c (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
46	597 - reproduced Stache*	VIII - 11a	61 1929 / 1 / 153c (old 5005)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
47	598		61 1929 / 1 / 153d (old 5006)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
48	599 - reproduced Stache	IX - 10	61 1929 / 1 / 154 (old 5007)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
49	600 - reproduced Stache	X - 2	61 1929 / 1 / 153d (old 5006)	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
50	601		87 1929 / 1 / 248	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Cellonetta	Cardiola Niveau (Ludlow)
51	602		87 1929 / 1 / 248	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Cellonetta	Cardiola Niveau (Ludlow)
52	603		88 1929 / 1 / 258	<i>Orthoceras amoenum</i> Barrande	<i>Merocyloceras</i> ? cf. <i>declivis</i> Ristedt	Cellonetta	Roter Kalk (Wenlock ?)
53	604		90 specimen not located	<i>Orthoceras amoenum</i> Barrande		Kellerwand	Roter Kalk (Wenlock ?)
54	605		61 specimen not located	<i>Orthoceras amoenum</i> Barrande		Wümlacher Alpe	?
55	606		61 specimen not located	<i>Orthoceras amoenum</i> Barrande		Wümlacher Alpe	?

	1	2	3	4	5	6	7	8
56	607 - reproduced Stache	II - 22	23	1929 / 1 / 31 (old 3731)	<i>Orthoceras confraternum</i> Barrande	<i>Geisonoceras</i> sp.	Dienten	Schiefer (Ludlow)
57	608 - reproduced Stache	II - 22a	23	1929 / 1 / 31 (old 3731)	<i>Orthoceras confraternum</i> Barrande	<i>Geisonoceras</i> sp.	Dienten	Schiefer (Ludlow)
58	609 - reproduced Stache	II - 22b	23	1929 / 1 / 31 (old 3731)	<i>Orthoceras confraternum</i> Barrande	<i>Geisonoceras</i> sp.	Dienten	Schiefer (Ludlow)
59		II - 22c	23	1929 / 1 / 31 (old 3731)	<i>Orthoceras confraternum</i> Barrande	<i>Geisonoceras</i> sp.	Dienten	Schiefer (Ludlow)
60	610 - reproduced Stache	II - 24	22	1929 / 1 / 28 (old 3727)	<i>Orthoceras subannulare</i> Münster	<i>Orthocycloceras</i> ? cf. <i>subannulare</i> (Münster)	Dienten	Schiefer (Ludlow)
61		II - 23	22	1929 / 1 / 28a (old 3727)	<i>Orthoceras subannulare</i> Münster	<i>Orthocycloceras</i> ? cf. <i>subannulare</i> (Münster)	Dienten	Schiefer (Ludlow)
62	611 - reproduced Stache	II - 27, 27a	22	1929 / 1 / 28b	<i>Orthoceras subannulare</i> Münster	Indeterminate orthocone	Dienten	Schiefer (Ludlow)
63	612 - reproduced Stache*	II - 27c	22	1929 / 1 / 28b	<i>Orthoceras subannulare</i> Münster	Indeterminate orthocone	Dienten	Schiefer (Ludlow)
64	613 - reproduced Stache	II - 28a	22	1929 / 1 / 28c (old 3734)	<i>Orthoceras subannulare</i> Münster	<i>Orthocycloceras</i> ? cf. <i>subannulare</i> (Münster)	Dienten	Schiefer (Ludlow)
65	614 - reproduced Stache	II - 28	22	1929 / 1 / 28c (old 3734)	<i>Orthoceras subannulare</i> Münster	<i>Orthocycloceras</i> ? cf. <i>subannulare</i> (Münster)	Dienten	Schiefer (Ludlow)
66		II - 28b	22	1929 / 1 / 28c (old 3734)	<i>Orthoceras subannulare</i> Münster	<i>Orthocycloceras</i> ? cf. <i>subannulare</i> (Münster)	Dienten	Schiefer (Ludlow)
67	615		65	1929 / 1 / 163 (old 5008)	<i>Orthoceras subannulare</i> Münster	<i>Merocycloceras</i> cf. <i>declivis</i> Fristedt	Kokberg	Roter Kalk (Wenlock/Ludlow)
68	616 - reproduced Stache	II - 26	23	specimen not located	<i>Orthoceras accuarium</i> Münster		Dienten	Schiefer (Ludlow)
69	617 - reproduced Stache*	II - 26a	23	specimen not located	<i>Orthoceras accuarium</i> Münster		Dienten	Schiefer (Ludlow)
70	618 - reproduced Stache*	VIII - 6a	69	1929 / 1 / 175	<i>Orthoceras accuarium</i> Münster	<i>Michelinoceras</i> cf. <i>michelini</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
71	619 - reproduced Stache	VIII - 6	69	1929 / 1 / 175	<i>Orthoceras accuarium</i> Münster	<i>Michelinoceras</i> cf. <i>michelini</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
72	620		69	1929 / 1 / 175	<i>Orthoceras accuarium</i> Münster	<i>Michelinoceras</i> cf. <i>michelini</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
73	621 - reproduced Stache	II - 29	24	1929 / 1 / 34 (old 3735)	<i>Orthoceras carinatum</i> Münster	Indeterminate orthocone	Dienten	Schiefer (Ludlow)
74	622 - reproduced Stache	IX - 12	65	1929 / 1 / 164 (old 5009)	<i>Orthoceras carinatum</i> Münster	<i>Merocycloceras</i> ? sp.	Kokberg	Roter Kalk (Wenlock/Ludlow)
75	623 - reproduced Stache	IX - 12a	65	1929 / 1 / 164 (old 5009)	<i>Orthoceras carinatum</i> Münster	<i>Merocycloceras</i> ? sp.	Kokberg	Roter Kalk (Wenlock/Ludlow)
76		IX - 12b	65	1929 / 1 / 164 (old 5009)	<i>Orthoceras carinatum</i> Münster	<i>Merocycloceras</i> ? sp.	Kokberg	Roter Kalk (Wenlock/Ludlow)
77	624		62	1929 / 1 / 155	<i>Orthoceras dulce</i> Barrande	<i>Orthocycloceras</i> cf. <i>lynx</i> (Barrande)	Kokberg	Schwarz Schiefer ?
78	625 - reproduced Stache	IX - 1	62	1929 / 1 / 155a (old 5038)	<i>Orthoceras dulce</i> Barrande	<i>Calorthoceras</i> cf. <i>pseudocalamiteum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
79	626 - reproduced Stache*	IX - 1a	62	1929 / 1 / 155a (old 5038)	<i>Orthoceras dulce</i> Barrande	<i>Calorthoceras</i> cf. <i>pseudocalamiteum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
80	627 - reproduced Stache	IX - 1b	62	1929 / 1 / 155a (old 5038)	<i>Orthoceras dulce</i> Barrande	<i>Calorthoceras</i> cf. <i>pseudocalamiteum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
81	628		63	1929 / 1 / 158	<i>Orthoceras</i> sp. (aff. <i>inchoatum</i> Barrande)	<i>Plagiostomoceras</i> cf. <i>gruenewaldti</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
82	629 - reproduced Stache	VIII - 13	63	1929 / 1 / 158	<i>Orthoceras</i> sp. (aff. <i>inchoatum</i> Barrande)	<i>Plagiostomoceras</i> cf. <i>gruenewaldti</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
83		VIII - 13a	63	1929 / 1 / 158	<i>Orthoceras</i> sp. (aff. <i>inchoatum</i> Barrande)	<i>Plagiostomoceras</i> cf. <i>gruenewaldti</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
84	630 - reproduced Stache	VIII - 13a	63	1929 / 1 / 158	<i>Orthoceras</i> sp. (aff. <i>inchoatum</i> Barrande)	<i>Plagiostomoceras</i> cf. <i>gruenewaldti</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
85	631 - reproduced Stache*	VIII - 13b	63	1929 / 1 / 158	<i>Orthoceras</i> sp. (aff. <i>inchoatum</i> Barrande)	<i>Plagiostomoceras</i> cf. <i>gruenewaldti</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
86	632		69 - 70	1929 / 1 / 177 (old 5010)	<i>Orthoceras currens</i> Barrande	<i>Michelinoceras currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
87	633		69 - 70	1929 / 1 / 177 (old 5010)	<i>Orthoceras currens</i> Barrande	<i>Michelinoceras currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
88	634		70	1929 / 1 / 178 (old 5035)	<i>Orthoceras</i> cf. <i>currens</i> Barrande	<i>Michelinoceras currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
89	635 - reproduced Stache	VIII - 7	69 - 70	1929 / 1 / 177 (old 5010)	<i>Orthoceras currens</i> Barrande	<i>Michelinoceras currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
90	636 - reproduced Stache*	VIII - 7a	69 - 70	1929 / 1 / 177 (old 5010)	<i>Orthoceras currens</i> Barrande	<i>Michelinoceras currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
91	637 - reproduced Stache	X - 16	70	1929 / 1 / 178 (old 5035)	<i>Orthoceras</i> cf. <i>currens</i> Barrande	<i>Michelinoceras currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
92	638 - reproduced Stache	X - 16a	70	1929 / 1 / 178 (old 5035)	<i>Orthoceras</i> cf. <i>currens</i> Barrande	<i>Michelinoceras currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
93	639		59	1929 / 1 / 150 (old 5011)	<i>Orthoceras</i> sp. (aff. <i>electum</i> Barrande)	<i>Kionoceras</i> aff. <i>electum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
94	640		59	1929 / 1 / 150 (old 5011)	<i>Orthoceras</i> sp. (aff. <i>electum</i> Barrande)	<i>Kionoceras</i> aff. <i>electum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
95	641		59	1929 / 1 / 150 (old 5011)	<i>Orthoceras</i> sp. (aff. <i>electum</i> Barrande)	<i>Kionoceras</i> aff. <i>electum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
96	642 - reproduced Stache	VII - 21	59	1929 / 1 / 150 (old 5011)	<i>Orthoceras</i> sp. (aff. <i>electum</i> Barrande)	<i>Kionoceras</i> aff. <i>electum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
97	643 - reproduced Stache*	VII - 21	59	1929 / 1 / 150 (old 5011)	<i>Orthoceras</i> sp. (aff. <i>electum</i> Barrande)	<i>Kionoceras</i> aff. <i>electum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
98	644 - reproduced Stache	X - 1	59 - 61	1929 / 1 / 152	<i>Orthoceras alticola</i> Barrande	Indeterminate orthocone	Kokberg	Schwarzer Kalk (Wenlock ?)
99	645		59 - 61	specimen not located	<i>Orthoceras alticola</i> Barrande		Cellonetta	Roter Kalk (Wenlock ?)
100	646		59 - 61	specimen not located	<i>Orthoceras alticola</i> Barrande		Rauchkofel Boden	Roter Kalk (Wenlock ?)
101	647 - reproduced Frech		59 - 61	Frech collection - not seen	<i>Orthoceras alticola</i> Barrande	<i>Orthoceras alticola</i> Barrande; Frech 1887, pl. 29, fig. 13		Oberes Valentintal Roter Kalk (Ludlow?)
102	648 - reproduced Frech		59 - 61	Frech collection - not seen	<i>Orthoceras alticola</i> Barrande	<i>Orthoceras alticola</i> Barrande; Frech 1887, pl. 28, fig. 2		Oberes Valentintal Roter Kalk (Ludlow?)
103	649		57 - 58	1929 / 1 / 147	<i>Orthoceras</i> cf. <i>praevalens</i> Barrande	<i>Michelinoceras</i> cf. <i>currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
104	650		57 - 58	specimen not located	<i>Orthoceras</i> cf. <i>praevalens</i> Barrande		Kokberg	Roter Kalk (Wenlock/Ludlow)
105	651 - reproduced Stache	X - 15	57 - 58	1929 / 1 / 147a (old 4990)	<i>Orthoceras</i> cf. <i>praevalens</i> Barrande	<i>Michelinoceras</i> cf. <i>currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
106		X - 15a	57 - 58	1929 / 1 / 147a (old 4990)	<i>Orthoceras</i> cf. <i>praevalens</i> Barrande	<i>Michelinoceras</i> cf. <i>currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
107		X - 15a	57 - 58	1929 / 1 / 147a (old 4990)	<i>Orthoceras</i> cf. <i>praevalens</i> Barrande	<i>Michelinoceras</i> cf. <i>currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
108	652 - reproduced Stache	X - 15b	57 - 58	1929 / 1 / 147a (old 4990)	<i>Orthoceras</i> cf. <i>praevalens</i> Barrande	<i>Michelinoceras</i> cf. <i>currens</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
109	653		57 - 58	1929 / 1 / 147b (old 5013)	<i>Orthoceras praevalens</i> Barrande	<i>Parakionoceras</i> cf. <i>originale</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
110	654		57 - 58	1929 / 1 / 147c (old 5013)	<i>Orthoceras praevalens</i> Barrande	<i>Kopanioceras</i> sp.	Kokberg	Schwarzer Kalk (Wenlock ?)

	1	2	3	4	5	6	7	8
111	655 - reproduced Stache	X - 10	57 - 58	1929 / 1 / 147c (old 5013)	<i>Orthoceras praevaleans</i> Barrande	<i>Kopaninoceras</i> sp.	Kokberg	Schwarzer Kalk (Wenlock ?)
112	656 - reproduced Stache*	X - 10a	57 - 58	1929 / 1 / 147c (old 5013)	<i>Orthoceras praevaleans</i> Barrande	<i>Kopaninoceras</i> sp.	Kokberg	Schwarzer Kalk (Wenlock ?)
113	657 - reproduced Stache	X - 10b	57 - 58	1929 / 1 / 147c (old 5013)	<i>Orthoceras praevaleans</i> Barrande	<i>Kopaninoceras</i> sp.	Kokberg	Schwarzer Kalk (Wenlock ?)
114	658 - reproduced Stache*	X - 18	66	1929 / 1 / 168	<i>Orthoceras cf. perlongum</i> Barrande	<i>Michelinoceras cf. michelini</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
115	659 - reproduced Stache	X - 19	66	1929 / 1 / 168a (old 5014)	<i>Orthoceras cf. perlongum</i> Barrande	<i>Michelinoceras cf. michelini</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
116	660 - reproduced Stache	X - 20	66	1929 / 1 / 168b (old 5015)	<i>Orthoceras cf. perlongum</i> Barrande	<i>Michelinoceras cf. michelini</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
117	661		66	1929 / 1 / 168b (old 5015)	<i>Orthoceras cf. perlongum</i> Barrande	<i>Michelinoceras cf. michelini</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
118	662 - reproduced Stache	VII - 14	63	1929 / 1 / 157 (old 5016)	<i>Orthoceras cf. pauper</i> Barrande	<i>Plagiostomoceras cf. pleurotomum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
119	663 - reproduced Stache*	VII - 14	63	1929 / 1 / 157 (old 5016)	<i>Orthoceras cf. pauper</i> Barrande	<i>Plagiostomoceras cf. pleurotomum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
120	664 - reproduced Stache	VII - 15	68	1929 / 1 / 173 (old 5017)	<i>Orthoceras cf. praecox</i> Barrande	<i>Merocyloceras cf. declivis</i> Ristedt	Kokberg	Schwarzer Kalk (Wenlock ?)
121	665 - reproduced Stache	VII - 15	68	1929 / 1 / 173 (old 5017)	<i>Orthoceras cf. praecox</i> Barrande	<i>Merocyloceras cf. declivis</i> Ristedt	Kokberg	Schwarzer Kalk (Wenlock ?)
122	666 - reproduced Stache*	VII - 15	68	1929 / 1 / 173 (old 5017)	<i>Orthoceras cf. praecox</i> Barrande	<i>Merocyloceras cf. declivis</i> Ristedt	Kokberg	Schwarzer Kalk (Wenlock ?)
123	667 - reproduced Stache	VII - 15	68	1929 / 1 / 173 (old 5017)	<i>Orthoceras cf. praecox</i> Barrande	<i>Merocyloceras cf. declivis</i> Ristedt	Kokberg	Schwarzer Kalk (Wenlock ?)
124	668 - reproduced Stache	VII - 17	57	1929 / 1 / 146 (old 5018)	<i>Orthoceras transiens</i> Barrande	<i>Pseudocycloceras aff. transiens</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
125	669 - reproduced Stache	VII - 17	57	1929 / 1 / 146a (old 5018)	<i>Orthoceras transiens</i> Barrande	<i>Pseudocycloceras aff. transiens</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
126	670 - reproduced Stache*	VII - 17	57	1929 / 1 / 146a (old 5018)	<i>Orthoceras transiens</i> Barrande	<i>Pseudocycloceras aff. transiens</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
127	671 - reproduced Stache*	VII - 17	57	1929 / 1 / 146a (old 5018)	<i>Orthoceras transiens</i> Barrande	<i>Pseudocycloceras aff. transiens</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
128	672 - reproduced Stache	VII - 19	58	1929 / 1 / 148 (old 5019)	<i>Orthoceras striatopunctatum</i> Münster	<i>Parakionoceras striatopunctatum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
129	673 - reproduced Stache	VII - 19	58	1929 / 1 / 148 (old 5019)	<i>Orthoceras striatopunctatum</i> Münster	<i>Parakionoceras striatopunctatum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
130	674 - reproduced Stache*	VII - 19	58	1929 / 1 / 148 (old 5019)	<i>Orthoceras striatopunctatum</i> Münster	<i>Parakionoceras striatopunctatum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
131	675 - reproduced Stache	VIII - 1	65	1929 / 1 / 165 (old 5020)	<i>Orthoceras aff. extenuatum</i> Barrande	<i>Plagiostomoceras aff. pleurotomum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
132	676 - reproduced Stache	VIII - 1a	65	1929 / 1 / 165 (old 5020)	<i>Orthoceras aff. extenuatum</i> Barrande	<i>Plagiostomoceras aff. pleurotomum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
133	677		65	1929 / 1 / 165 (old 5020)	<i>Orthoceras aff. extenuatum</i> Barrande	<i>Plagiostomoceras aff. pleurotomum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
134	678 - reproduced Stache	VIII - 2	63 - 64	1929 / 1 / 159 (old 5040)	<i>Orthoceras littorale</i> Barrande	<i>Anonoceras</i> sp.	Kokberg	Schwarzer Kalk (Wenlock ?)
135	679 - reproduced Stache	VIII - 3	69	1929 / 1 / 176 (old 5037)	<i>Orthoceras arion</i> barrande	<i>Anonoceras affine</i> (Meneghini)	Kokberg	Schwarzer Kalk (Wenlock ?)
136	680 - reproduced Stache*	VIII - 3a	69	1929 / 1 / 176 (old 5037)	<i>Orthoceras arion</i> barrande	<i>Anonoceras affine</i> (Meneghini)	Kokberg	Schwarzer Kalk (Wenlock ?)
137	681 - reproduced Stache	VIII - 4	69	1929 / 1 / 176 (old 5037)	<i>Orthoceras arion</i> barrande	<i>Anonoceras affine</i> (Meneghini)	Kokberg	Schwarzer Kalk (Wenlock ?)
138	682 - reproduced Stache*	VIII - 4a	69	1929 / 1 / 176 (old 5037)	<i>Orthoceras arion</i> barrande	<i>Anonoceras affine</i> (Meneghini)	Kokberg	Schwarzer Kalk (Wenlock ?)
139	683 - reproduced Stache	VIII - 8	68	1929 / 1 / 174	<i>Orthoceras venustulum</i> Barrande	<i>Calorthoceras aff. pseudocalamiteum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
140	684 - reproduced Stache	VIII - 14	67 - 68	specimen not located	<i>Orthoceras truncatum</i> Barrande		Kokberg	Roter Kalk (Wenlock/Ludlow)
141	685 - reproduced Stache	VIII - 14	67 - 68	specimen not located	<i>Orthoceras truncatum</i> Barrande		Kokberg	Roter Kalk (Wenlock/Ludlow)
142	686 - reproduced Stache	IX - 3	67	1929 / 1 / 170	<i>Orthoceras tiro</i> Barrande	<i>Kionoceras cf. tiro</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
143	687 - reproduced Stache	IX - 3a	67	1929 / 1 / 170	<i>Orthoceras tiro</i> Barrande	<i>Kionoceras cf. tiro</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
144	688 - reproduced Stache*	IX - 3b	67	1929 / 1 / 170	<i>Orthoceras tiro</i> Barrande	<i>Kionoceras cf. tiro</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
145	689 - reproduced Stache	IX - 4	58	1929 / 1 / 149 (old 5021)	<i>Orthoceras cf. bacchus</i> Barrande	<i>Calorthoceras aff. pseudocalamiteum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
146		IX - 5	58	1929 / 1 / 149 (old 5021)	<i>Orthoceras cf. bacchus</i> Barrande	<i>Calorthoceras aff. pseudocalamiteum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
147	690 - reproduced Stache	IX - 6	62	1929 / 1 / 156	<i>Orthoceras cf. lunaticum</i> Barrande	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
148		IX - 6b	62	1929 / 1 / 156	<i>Orthoceras cf. lunaticum</i> Barrande	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
149	691 - reproduced Stache	IX - 9	57	1929 / 1 / 145 (old 5024)	<i>Orthoceras cf. conviva</i> Barrande	<i>Pseudocycloceras ? cf. conviva</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
150	692 - reproduced Stache	IX - 14	59	1929 / 1 / 151 (old 5025)	<i>Orthoceras cf. Agassizi</i> Barrande	<i>Columnoceras cf. Agassizi</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
151	693 - reproduced Stache	IX - 14a	59	1929 / 1 / 151 (old 5025)	<i>Orthoceras cf. Agassizi</i> Barrande	<i>Columnoceras cf. Agassizi</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
152	694 - incorrect rep. Stache	IX - 14b	59	1929 / 1 / 151 (old 5025)	<i>Orthoceras cf. Agassizi</i> Barrande	<i>Columnoceras cf. Agassizi</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
153	695 - reproduced Stache*	IX - 15	64	1929 / 1 / 162 (old 5014)	<i>Orthoceras cf. pleurotomum</i> Barrande	<i>Plagiostomoceras cf. pleurotomum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
154	696 - reproduced Stache	IX - 15a	64	1929 / 1 / 162 (old 5014)	<i>Orthoceras cf. pleurotomum</i> Barrande	<i>Plagiostomoceras cf. pleurotomum</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
155	697 - reproduced Stache	IX - 17	68	1929 / 1 / 172 (old 5023)	<i>Orthoceras acus</i> Barrande	<i>Plagiostomoceras</i> sp.	Kokberg	Roter Kalk (Wenlock/Ludlow)
156	698 - reproduced Stache	IX - 17a	68	1929 / 1 / 172 (old 5023)	<i>Orthoceras acus</i> Barrande	<i>Plagiostomoceras</i> sp.	Kokberg	Roter Kalk (Wenlock/Ludlow)
157	699	IX - 23	65 - 66	1929 / 1 / 166 (old 5026)	<i>Orthoceras firmum</i> Barrande	<i>Anonoceras</i> sp.	Kokberg	Schwarzer Kalk (Wenlock ?)
158	700 - reproduced Stache	X - 17	65 - 66	1929 / 1 / 166a (old 5026)	<i>Orthoceras firmum</i> Barrande	<i>Anonoceras aff. affine</i> (Meneghini)	Kokberg	Schwarzer Kalk (Wenlock ?)
159	701		87	1929 / 1 / 247	<i>Orthoceras firmum</i> Barrande	<i>Anonoceras ?</i> sp.	Cellonetta	Cardiola Niveau (Ludlow)
160	702		66	1929 / 1 / 167 (old 5027)	<i>Orthoceras cf. firmum</i> Barrande	<i>Michelinoceras</i> sp.	Kokberg	Roter Kalk (Wenlock/Ludlow)
161	703 - reproduced Stache	X - 13	66	1929 / 1 / 167 (old 5027)	<i>Orthoceras cf. firmum</i> Barrande	<i>Michelinoceras</i> sp.	Kokberg	Roter Kalk (Wenlock/Ludlow)
162	704 - reproduced Stache	X - 3	70	1929 / 1 / 179 (old 5028)	<i>Orthoceras cf. germanum</i> Barrande	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
163	705 - reproduced Stache	X - 3a	70	1929 / 1 / 179 (old 5028)	<i>Orthoceras cf. germanum</i> Barrande	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
164	706 - reproduced Stache*	X - 3b	70	1929 / 1 / 179 (old 5028)	<i>Orthoceras cf. germanum</i> Barrande	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
165	707 - reproduced Stache*	X - 3c	70	1929 / 1 / 179 (old 5028)	<i>Orthoceras cf. germanum</i> Barrande	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)

	1	2	3	4	5	6	7	8
166	708 - reproduced Stache	X - 4	66 - 67	1929 / 1 / 169 (old 5041)	<i>Orthoceras potens</i> Barrande	<i>Kopaninoceras cf. jucundum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
167	709 - reproduced Stache	X - 4a	66 - 67	1929 / 1 / 169 (old 5041)	<i>Orthoceras potens</i> Barrande	<i>Kopaninoceras cf. jucundum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
168		X - 4a	66 - 67	1929 / 1 / 169 (old 5041)	<i>Orthoceras potens</i> Barrande	<i>Kopaninoceras cf. jucundum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
169	710		66 - 67	1929 / 1 / 169 (old 5041)	<i>Orthoceras potens</i> Barrande	<i>Kopaninoceras cf. jucundum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
170	711 - reproduced Stache	X - 6	64	1929 / 1 / 160 (old 5039)	<i>Orthoceras cf. severum</i> Barrande	<i>Geisonoceras cf. severum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
171	712 - reproduced Stache	X - 6a	64	1929 / 1 / 160a (old 5039)	<i>Orthoceras cf. severum</i> Barrande	<i>Geisonoceras cf. severum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
172	713 - reproduced Stache	X - 6b	64	1929 / 1 / 160 (old 5039)	<i>Orthoceras cf. severum</i> Barrande	<i>Geisonoceras cf. severum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
173		X - 6c	64	1929 / 1 / 160 (old 5039)	<i>Orthoceras cf. severum</i> Barrande	<i>Geisonoceras cf. severum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
174	714		70	1929 / 1 / 181 (old 5029)	<i>Orthoceras migrans</i> Barrande	<i>Michelinoceras ? cf. migrans</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
175	715 - reproduced Stache	X - 7	70	1929 / 1 / 181 (old 5029)	<i>Orthoceras migrans</i> Barrande	<i>Michelinoceras ? cf. migrans</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
176	716 - reproduced Stache	X - 12	71	1929 / 1 / 182 (old 5030)	<i>Orthoceras sp.</i>	<i>Indeterminate orthocone</i>	Kokberg	Schwarzer Tonschiefer ?
177	717 - reproduced Stache	X - 5	71	1929 / 1 / 183	<i>Orthoceras sp.</i>	<i>Columnoceras sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
178	718 - reproduced Stache*	X - 5a	71	1929 / 1 / 183	<i>Orthoceras sp.</i>	<i>Columnoceras sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
179	719 - reproduced Stache	IX - 8	71	1929 / 1 / 184	<i>Orthoceras sp.</i>	<i>Plagiostomoceras sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
180	720 - reproduced Stache	IX - 16	71	1929 / 1 / 185	<i>Orthoceras sp.</i>	<i>Columnoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
181	721 - reproduced Stache	IX - 16a	71	1929 / 1 / 185	<i>Orthoceras sp.</i>	<i>Columnoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
182	722 - reproduced Stache	IX - 16b	71	1929 / 1 / 185	<i>Orthoceras sp.</i>	<i>Columnoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
183		IX - 16c	71	1929 / 1 / 185	<i>Orthoceras sp.</i>	<i>Columnoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
184	723 - reproduced Stache	IX - 22	71	1929 / 1 / 186 (old 5036)	<i>Orthoceras sp.</i>	<i>Anonoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
185	724 - reproduced Stache	IX - 22a	71	1929 / 1 / 186 (old 5036)	<i>Orthoceras sp.</i>	<i>Anonoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
186	725 - reproduced Stache	IX - 22b	71	1929 / 1 / 186 (old 5036)	<i>Orthoceras sp.</i>	<i>Anonoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
187	726 - reproduced Stache*	IX - 22c	71	1929 / 1 / 186 (old 5036)	<i>Orthoceras sp.</i>	<i>Anonoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
188	727 - reproduced Stache*	IX - 22d	71	1929 / 1 / 186 (old 5036)	<i>Orthoceras sp.</i>	<i>Anonoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
189	728 - reproduced Stache	IX - 7	72	1929 / 1 / 187	<i>Orthoceras sp.</i>	<i>Plagiostomoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
190	729 - reproduced Stache	VII - 18	72	1929 / 1 / 188 (old 5032)	<i>Orthoceras sp.</i>	<i>Pseudocycloceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
191	730 - reproduced Stache*	VII - 18	72	1929 / 1 / 188 (old 5032)	<i>Orthoceras sp.</i>	<i>Pseudocycloceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
192	731 - reproduced Stache	VII - 16	72	1929 / 1 / 189 (old 5031)	<i>Orthoceras sp.</i>	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
193	732 - reproduced Stache*	VII - 16	72	1929 / 1 / 189 (old 5031)	<i>Orthoceras sp.</i>	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
194	733 - reproduced Stache	X - 14	72	1929 / 1 / 190	<i>Orthoceras sp.</i>	<i>Kopaninoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
195	734 - reproduced Stache	IX - 18	72	1929 / 1 / 191 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
196	735 - reproduced Stache	IX - 24	72	1929 / 1 / 191a (old 5033)	<i>Orthoceras sp.</i>	<i>Plagiostomoceras cf. pleurotomum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
197	736 - reproduced Stache	X - 11	72	1929 / 1 / 192 (old 5033)	<i>Orthoceras sp.</i>	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
198		X - 11a	72	1929 / 1 / 192 (old 5033)	<i>Orthoceras sp.</i>	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
199	737 - reproduced Stache*	IX - 24a	73	1929 / 1 / 191a (old 5033)	<i>Orthoceras sp.</i>	<i>Plagiostomoceras cf. pleurotomum</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
200	738 - reproduced Stache*	IX - 18b	73	1929 / 1 / 191 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
201	739 - reproduced Stache	IX - 18a	73	1929 / 1 / 191 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
202		IX - 18c	73	1929 / 1 / 191 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
203	740 - reproduced Stache	IX - 19	73	1929 / 1 / 193 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
204	741 - reproduced Stache	IX - 19a	73	1929 / 1 / 193 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
205	742 - reproduced Stache*	IX - 19b	73	1929 / 1 / 193 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
206		IX - 19c	73	1929 / 1 / 193 (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
207	743 - reproduced Stache	IX - 20	73	1929 / 1 / 193a (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
208	744 - reproduced Stache	IX - 20a	73	1929 / 1 / 193a (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
209	745 - reproduced Stache*	IX - 20b	73	1929 / 1 / 193a (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
210		IX - 20c	73	1929 / 1 / 193a (old 5033)	<i>Orthoceras sp.</i>	<i>Hemicosmorhoceras sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
211	746 - reproduced Stache	VIII - 5	73	specimen not located	<i>Orthoceras sp.</i>		Kokberg	Roter Kalk (Wenlock/Ludlow)
212	747 - reproduced Stache*	VIII - 5a	73	specimen not located	<i>Orthoceras sp.</i>		Kokberg	Roter Kalk (Wenlock/Ludlow)
213	748 - reproduced Stache	IX - 13	73	1929 / 1 / 195	<i>Orthoceras sp.</i>	<i>Plagiostomoceras cf. gruenewaldti</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
214	749 - reproduced Stache	VII - 20	73	1929 / 1 / 196 (old 5034)	<i>Orthoceras sp.</i>	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
215	750 - reproduced Stache	VII - 20	73	1929 / 1 / 196 (old 5034)	<i>Orthoceras sp.</i>	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
216	751 - reproduced Stache*	VII - 20	73	1929 / 1 / 196 (old 5034)	<i>Orthoceras sp.</i>	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
217	752 - reproduced Stache*	VII - 20	73	1929 / 1 / 196 (old 5034)	<i>Orthoceras sp.</i>	<i>Orthocycloceras cf. lynx</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
218	753 - reproduced Stache	IX - 2	73	1929 / 1 / 197	<i>Orthoceras sp.</i>	<i>Indeterminate orthocone</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
219	754		74	1929 / 1 / 199 (old 5050)	<i>Trochoceras carinthiacum</i> Stache	<i>Lechnitrochoceras cf. hoernesii</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
220	755 - reproduced Stache	VII - 4	74	1929 / 1 / 199 (old 5050)	<i>Trochoceras carinthiacum</i> Stache	<i>Lechnitrochoceras cf. hoernesii</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)

1	2	3	4	5	6	7	8	
221	756 - reproduced Stache	VII - 4a	74	1929 / 1 / 199 (old 5050)	<i>Trochoceras canthiacum</i> Stache	<i>Lechnitrochoceras cf. hoernesii</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
222	757 - reproduced Stache	VII - 4b	74	1929 / 1 / 199 (old 5050)	<i>Trochoceras canthiacum</i> Stache	<i>Lechnitrochoceras cf. hoernesii</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
223	758 - reproduced Stache	VII - 4c	74	1929 / 1 / 199 (old 5050)	<i>Trochoceras canthiacum</i> Stache	<i>Lechnitrochoceras cf. hoernesii</i> (Barrande)	Kokberg	Schwarzer Kalk (Wenlock ?)
224	759 - reproduced Stache	VII - 1	74	1929 / 1 / 200 (old 5051)	<i>Barrandoceras cf. Sacheri</i> Barrande	<i>Gastropod sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
225	760 - reproduced Stache	VII - 1a	74	1929 / 1 / 200 (old 5051)	<i>Barrandoceras cf. Sacheri</i> Barrande	<i>Gastropod sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
226	761 - reproduced Stache	VII - 1b	74	1929 / 1 / 200 (old 5051)	<i>Barrandoceras cf. Sacheri</i> Barrande	<i>Gastropod sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
227	762 - reproduced Stache	VII - 2	74	1929 / 1 / 200a (old 5053)	<i>Barrandoceras cf. Sacheri</i> Barrande	<i>Barrandoceras ? sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
228	763 - reproduced Stache	VII - 3	74	1929 / 1 / 201 (old 5052)	<i>Barrandoceras sp.</i>	<i>Barrandoceras ? sp.</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
229	764		56	1929 / 1 / 140 (old 5045)	<i>Cyrtoceras cycloideum</i> Barrande	<i>Oocenna ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
230	765 - reproduced Stache	VII - 5	56	1929 / 1 / 140 (old 5045)	<i>Cyrtoceras cycloideum</i> Barrande	<i>Oocenna ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
231	766 - reproduced Stache	VII - 5a	56	1929 / 1 / 140 (old 5045)	<i>Cyrtoceras cycloideum</i> Barrande	<i>Oocenna ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
232	767 - reproduced Stache	VII - 5b	56	1929 / 1 / 140 (old 5045)	<i>Cyrtoceras cycloideum</i> Barrande	<i>Oocenna ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
233	768		56	1929 / 1 / 139 (old 5048)	<i>Cyrtoceras circumflexum</i> Barrande	<i>Uranoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
234	769 - reproduced Stache	VII - 8	56	1929 / 1 / 139 (old 5048)	<i>Cyrtoceras circumflexum</i> Barrande	<i>Uranoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
235	770 - reproduced Stache	VII - 8	56	1929 / 1 / 139 (old 5048)	<i>Cyrtoceras circumflexum</i> Barrande	<i>Uranoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
236	771 - reproduced Stache	VII - 8	56	1929 / 1 / 139 (old 5048)	<i>Cyrtoceras circumflexum</i> Barrande	<i>Uranoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
237	772 - reproduced Stache*	VII - 8	56	1929 / 1 / 139 (old 5048)	<i>Cyrtoceras circumflexum</i> Barrande	<i>Uranoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
238	773 - reproduced Stache	VII - 8	56	1929 / 1 / 139 (old 5048)	<i>Cyrtoceras circumflexum</i> Barrande	<i>Uranoceras ? sp.</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
239	774 - reproduced Stache	VII - 9	56	1929 / 1 / 141 (old 5044)	<i>Cyrtoceras imbellis</i> Barrande	<i>Indeterminate cyrtocone</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
240	775 - reproduced Stache	VII - 9	56	1929 / 1 / 141 (old 5044)	<i>Cyrtoceras imbellis</i> Barrande	<i>Indeterminate cyrtocone</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
241	776 - reproduced Stache	VII - 9	56	1929 / 1 / 141 (old 5044)	<i>Cyrtoceras imbellis</i> Barrande	<i>Indeterminate cyrtocone</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
242	777 - reproduced Stache	VII - 6	56	1929 / 1 / 144 (old 5049)	<i>Cyrtoceras sp.</i>	<i>Indeterminate cyrtocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
243	778 - reproduced Stache	VII - 10	56	1929 / 1 / 143 (old 5046)	<i>Cyrtoceras sp.</i>	<i>Indeterminate cyrtocone</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
244	779 - reproduced Stache	VII - 10a	56	1929 / 1 / 143 (old 5046)	<i>Cyrtoceras sp.</i>	<i>Indeterminate cyrtocone</i>	Kokberg	Schwarzer Kalk (Wenlock ?)
245	780 - reproduced Stache	IX - 11	56	1929 / 1 / 142 (old 5047)	<i>Cyrtoceras sp.</i>	<i>Plagiostomoceras cf. gruenewaldti</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
246	781 - reproduced Stache	IX - 11a	56	1929 / 1 / 142 (old 5047)	<i>Cyrtoceras sp.</i>	<i>Plagiostomoceras cf. gruenewaldti</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
247	782 - reproduced Stache*	IX - 11b	56	1929 / 1 / 142 (old 5047)	<i>Cyrtoceras sp.</i>	<i>Plagiostomoceras cf. gruenewaldti</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
248	783		56	1929 / 1 / 142 (old 5047)	<i>Cyrtoceras sp.</i>	<i>Plagiostomoceras cf. gruenewaldti</i> (Barrande)	Kokberg	Roter Kalk (Wenlock/Ludlow)
249		II - 9		1999 / 5 / 1 (old 3730)	<i>not described</i>	<i>Parakionoceras sp.</i>	Dienten	Schiefer (Ludlow)
250		II - 11		1999 / 5 / 2 (old 3733)	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
251		II - 11a		1999 / 5 / 2 (old 3733)	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
252		II - 13		1999 / 5 / 2a	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
253		II - 13a*		1999 / 5 / 2a	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
254		II - 13a		1999 / 5 / 2a	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
255		II - 13b		1999 / 5 / 2a	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
256		II - 14		1999 / 5 / 2b (old 3736)	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
257		II - 14a		1999 / 5 / 2b (old 3736)	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
258		II - 16		1999 / 5 / 2c (old 3724)	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
259		II - 25*		1999 / 5 / 3	<i>not described</i>	<i>Geisonoceras ? sp.</i>	Dienten	Schiefer (Ludlow)
260		II - 25a*		1999 / 5 / 3	<i>not described</i>	<i>Geisonoceras ? sp.</i>	Dienten	Schiefer (Ludlow)
261		II - 25*		1999 / 5 / 2d	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
262		II - 25a*		1999 / 5 / 2d	<i>not described</i>	<i>Indeterminate orthocone</i>	Dienten	Schiefer (Ludlow)
263		IX - 21		specimen not located	<i>not described</i>		Kokberg	
264		IX - 21a		specimen not located	<i>not described</i>		Kokberg	
265		IX - 21b*		specimen not located	<i>not described</i>		Kokberg	
266		IX - 25		specimen not located	<i>not described</i>		Kokberg	
267		IX - 25a*		specimen not located	<i>not described</i>		Kokberg	
268		IX - 26		specimen not located	<i>not described</i>		Kokberg	
269		IX - 26		specimen not located	<i>not described</i>		Kokberg	
270		IX - 26a*		specimen not located	<i>not described</i>		Kokberg	
271		X - 8		1999 / 5 / 2e	<i>not described</i>	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
272		X - 8a		1999 / 5 / 2e	<i>not described</i>	<i>Indeterminate orthocone</i>	Kokberg	Roter Kalk (Wenlock/Ludlow)
273		X - 9		specimen not located	<i>not described</i>		Kokberg	

Genus *Merocycloceras* RISTEDT, 1968

Type-species: By original designation *Merocycloceras declivis* RISTEDT 1968

***Merocycloceras cf. declivis* RISTEDT 1968**

(Pl. 2: HERITSCH, Pl. VI, Figs. 615, 664–667; STACHE, Pl. VII, Fig. 15)

1929 *Orthoceras subannulare* MÜNSTER – HERITSCH, 65, Fig. 615.

1929 *Orthoceras cf. praecox* BARRANDE – HERITSCH, 68, Figs. 664–667.

Description: As given by HERITSCH (1929).

Remarks: The specimens do not show the characters of either of the species to which they were assigned by HERITSCH (1929) but may be compared to *Merocycloceras declivis* RISTEDT in both the ornament and internal features.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/163; GBA 1929/1/173.

***Merocycloceras ? cf. declivis* RISTEDT 1968**

(Pls 1, 2, 4, 5, 6, 7: HERITSCH, Pl. V, Figs. 586, 587, 591–605; Pl. VI, Fig. 606; STACHE, Pl. II, Figs. 21, 21a; Pl. VIII, Figs. 9–9c, 10, 10a, 11, 11a; Pl. IX, Fig. 10; Pl. X, Fig. 2)

1929 *Orthoceras amoenum* BARRANDE – HERITSCH, 22, 61, 87, 88, 90, Figs. 586–587, 592–598, 600–606.

1929 *Orthoceras aff. amoenum* BARRANDE – HERITSCH, 61, Figs. 591, 599.

Description: As given by HERITSCH (1929).

Remarks: The specimens are overall quite well preserved externally however, the transverse ornament is too strongly developed to be assigned to *Orthoceras amoenum* BARRANDE but is distinctive of *Merocycloceras declivis* RISTEDT. Other generic and specific characters such as the internal siphuncular features are not well developed or preserved in most of the material therefore the specimens are assigned with some doubt to *Merocycloceras* RISTEDT.

Occurrence: Dienten (Ludlow ?), Kokberg, Roter Kalk (Wenlock/Ludlow), Cellonetta, Cardiola Niveau (Ludlow), Cello-netta, Roter Kalk (Wenlock), Kellerwand, Roter Kalk (Wenlock – Ludlow ?), Würmlacher Alpe (?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Nine specimens – GBA 1929/1/29; GBA 1929/1/153; GBA 1929/1/153a; GBA 1929/1/153b; GBA 1929/1/153c; GBA 1929/1/153d; GBA 1929/1/154; GBA 1929/1/248; GBA 1929/1/258.

***Merocycloceras ? sp.***

(Pls 2, 6: HERITSCH, Pl. VI, Figs. 622–623; STACHE, Pl. IX, Figs. 12–12b)

1929 *Orthoceras carinatum* MÜNSTER – HERITSCH, 65, Figs. 622–623.

Description: As given by HERITSCH (1929).

Remarks: Only the external transverse ornament is preserved which allows a tentative assignment to *Merocycloceras* RISTEDT.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/164.

Genus *Kopaninoceras* KISELEV, 1969

Type species: By original designation *Orthoceras jucundum* BARRANDE, 1870.

***Kopaninoceras cf. jucundum* (BARRANDE, 1870)**

(Pls 3, 7: HERITSCH, Pl. VII, Figs. 708–710; STACHE, Pl. X, Figs. 4, 4a, 4a)

1929 *Orthoceras potens* BARRANDE – HERITSCH, 66–67, Figs. 708–710. Pl. 1, Figs. 1a–b, Text–Fig. 3.

Description: As given by HERITSCH (1929).

Remarks: The specimen does not belong to *Orthoceras potens* BARRANDE as the siphuncle is too narrow. It is badly preserved but it is possible to distinguish the diagnostic elongated funnel shape septal necks of *Kopaninoceras* KISELEV and compare it to *Orthoceras jucundum* BARRANDE. The test is apparently smooth.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/169.

***Kopaninoceras sp.***

(Pls 2, 7: HERITSCH, Pl. VI, Figs. 654–657; Pl. VII, Fig. 733; STACHE, Pl. X, Figs. 10–10b, 14)

1929 *Orthoceras praevalens* BARRANDE – HERITSCH, 57–58, Figs. 654–657.

1929 *Orthoceras sp.* – HERITSCH, 72, Fig. 733.

Description: As given by HERITSCH (1929).

Remarks: The specimen assigned by HERITSCH (1929) to *Orthoceras praevalens* BARRANDE has short chambers and no external ornament therefore it must be excluded from this species. The overall conch form suggests that it may belong to *Kopaninoceras* KISELEV. The second specimen studied also has the typical conch form of the genus even if in both specimens the diagnostic siphuncular features are not preserved.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna

Material studied: Two specimens – GBA 1929/1/147c; GBA 1929/1/190.

Genus *Plagiostomoceras* TEICHERT & GLENISTER, 1952

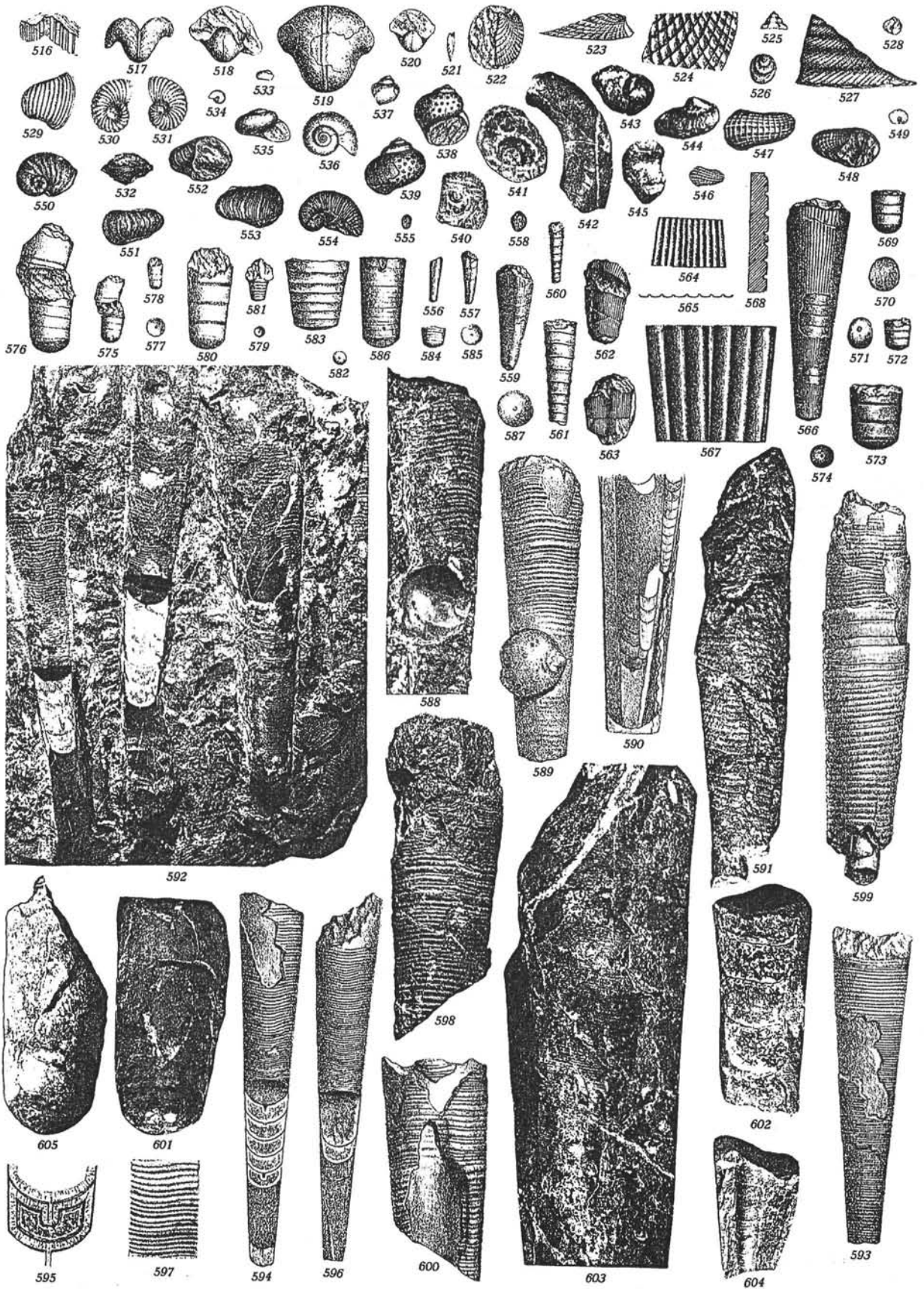
Type species: By original designation *Orthoceras pleurotomum* BARRANDE, 1866.

***Plagiostomoceras cf. gruenewaldti* (BARRANDE, 1866)**

(Pls 2, 5, 6: HERITSCH, Pl. VI, Figs. 628–631; Pl. VII, Figs. 748, 780–783; STACHE, Pl. VIII, Figs. 13–13b; Pl. IX, Figs. 11–11b, 13)

**Plate 1:**

Reproduced from Plate V of HERITSCH, 1929, mag. X 90 %. Refer to Table 1 for specific determinations of the material figured.



- 1929 *Orthoceras* sp. (aff. *inchoatum* BARRANDE) – HERITSCH, 63, Figs. 628–631.  
 1929 *Orthoceras* sp. – HERITSCH, 73, Figs. 748.  
 1929 *Cyrtoceras* sp. – HERITSCH, 56, Figs. 780–783.

Description: As given by HERITSCH (1929).

Remarks: All the studied specimens possess the diagnostic ornament of *Plagiostomoceras gruenewaldti* (BARRANDE) to which they have been compared even if in most of the material internal features are not preserved.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna

Material studied: Three specimens – GBA 1929/1/158; GBA 1929/1/195; GBA 1929/1/142.

***Plagiostomoceras* cf. *pleurotomum* (BARRANDE, 1860)**

(Pls 2, 3, 6: HERITSCH, Pl. VI, Figs. 662–663; Pl. VII, Figs. 695–696, 735, 737; STACHE, Pl. VII, Fig. 14; Pl. IX, Figs. 15, 15a, 24, 24a)

- 1929 *Orthoceras* cf. *pauper* BARRANDE – HERITSCH, 63, Figs. 662–663.  
 1929 *Orthoceras* cf. *pleurotomum* BARRANDE – HERITSCH, 64, Figs. 695–696.  
 1929 *Orthoceras* sp. – HERITSCH, 72, 73, Figs. 735, 737.

Description: As given by HERITSCH (1929).

Remarks: The material studied is in general quite poor. The ornament and conch form however, allow a comparison with *Plagiostomoceras pleurotomum* (BARRANDE).

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Three specimens – GBA 1929/1/157; GBA 1929/1/162; GBA 1929/1/191a.

***Plagiostomoceras* aff. *pleurotomum* (BARRANDE, 1860)**

(Pls 2, 5: HERITSCH, Pl. VI, Figs. 675–677; STACHE, Pl. VIII, Figs. 1, 1a)

- 1929 *Orthoceras* aff. *extenuatum* BARRANDE – HERITSCH, 65, Figs. 675–677.

Description: As given by HERITSCH (1929).

Remarks: The specimen is only a fragment of body chamber therefore it is impossible to distinguish the specific characters needed for assignment to *Orthoceras extenuatum* BARRANDE. The external ornament is quite well preserved and allows a tentative assignment to *Plagiostomoceras pleurotomum* (BARRANDE) based only on this feature.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna

Material studied: One specimen – GBA 1929/1/165.

***Plagiostomoceras* sp.**

(Pls 3, 6: HERITSCH, Pl. VII, Figs. 697–698, 719; STACHE, Pl. IX, Figs. 8, 17, 17a)

- 1929 *Orthoceras acus* BARRANDE – HERITSCH, 68, Figs. 697–698.  
 1929 *Orthoceras* sp. – HERITSCH, 71, Fig. 719.

Description: As given by HERITSCH (1929).

Remarks: The diagnostic ornament of the genus is well preserved however, not enough features are present to allow the material to be specifically assigned.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/172; GBA 1929/1/184.

***Plagiostomoceras* ? sp.**

(Pls 3, 6: HERITSCH, Pl. VII, Fig. 728; STACHE, Pl. IX, Fig. 7)

- 1929 *Orthoceras* sp. – HERITSCH, 72, Fig. 728.

Description: As given by HERITSCH (1929).

Remarks: Badly preserved fragment of shell. The transverse ornament may be compared with some doubt to *Plagiostomoceras* TEICHERT & GLENISTER.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna

Material studied: One specimen – GBA 1929/1/187.

5.2.1.2.2. Subfamily KIONOCERATINAE HYATT *In* ZITTEL, 1900  
 Genus *Kionoceras* HYATT, 1884

Type-species: By original designation *Orthoceras doricum* BARRANDE, 1868.

***Kionoceras* aff. *electum* (BARRANDE, 1868)**

(Pl. 2: HERITSCH, Pl. VI, Figs. 639–643; STACHE, Pl. VII, Fig. 21)

- 1929 *Orthoceras* sp. (aff. *electum* BARRANDE) – HERITSCH, 59, Figs. 639–643.

Description: As given by HERITSCH (1929).

Remarks: The specimen clearly may be attributed to *Kionoceras* HYATT on the basis of the ornament alone however, as the internal specific characters are not well preserved the specimen is assigned with some doubt to *Kionoceras* (*Orthoceras*) *electum* BARRANDE.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/150.

***Kionoceras* cf. *tiro* (BARRANDE, 1868)**

(Pls 3, 6: HERITSCH, Pl. VII, Figs. 686–688; STACHE, Pl. IX, Figs. 3–3b)

- 1929 *Orthoceras tiro* BARRANDE – HERITSCH, 67, Figs. 686–688.

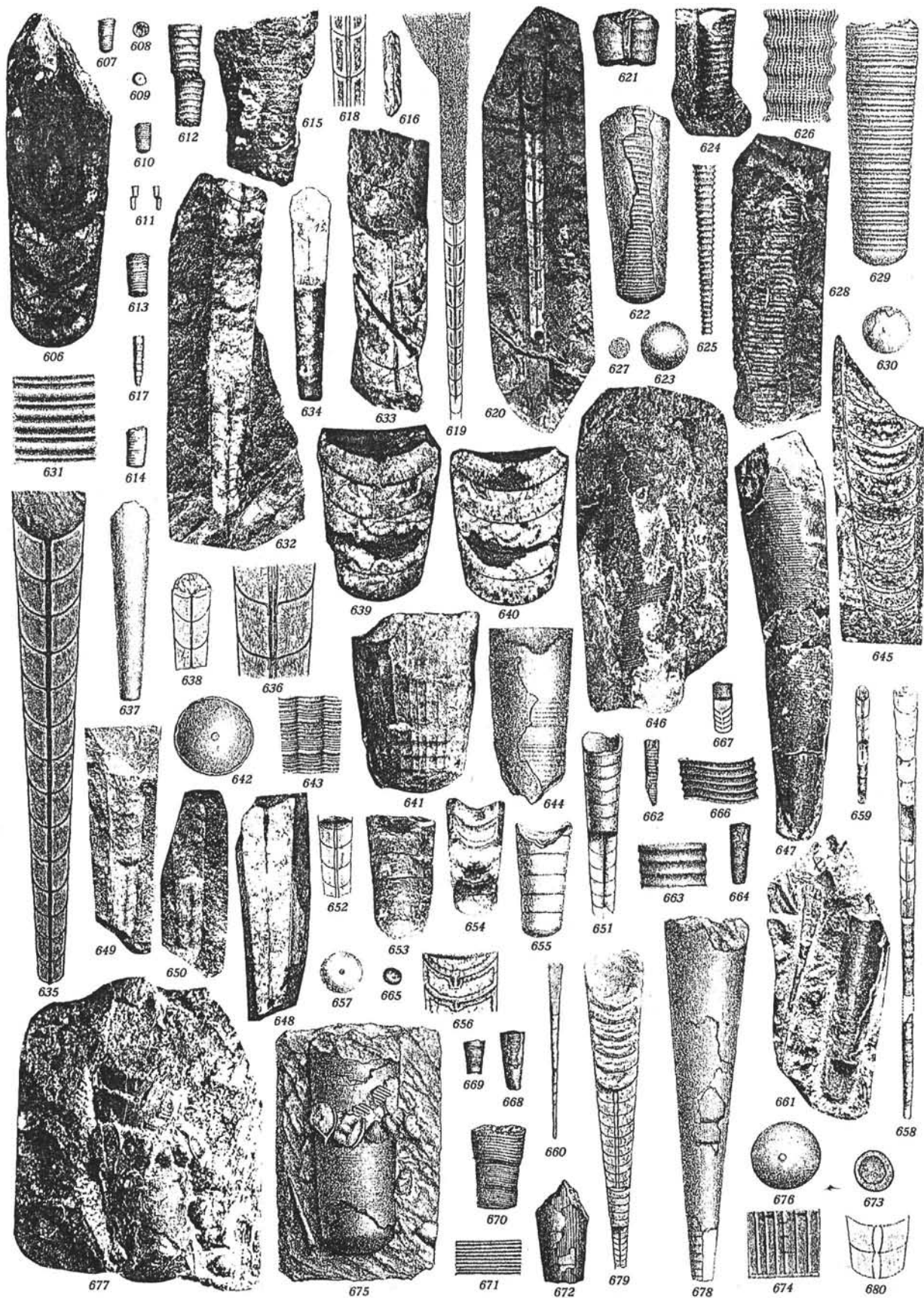
Description: As given by HERITSCH (1929).

Remarks: Only a fragment of the body chamber is preserved which shows clearly the diagnostic external ornament of *Kionoceras* Hyatt. A tentative comparison with *Orthoceras*

**Plate 2:**

Reproduced from Plate VI of HERITSCH, 1929, mag. X 90 %. Refer to Table 1 for specific determinations of the material figured.





*tiro* BARRANDE is made based on the ornament and rate of expansion of the conch.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/170.

Genus *Parakionoceras* FOERSTE 1928

Type species: By original designation *Orthoceras originale* BARRANDE, 1868.

***Parakionoceras cf. originale* (BARRANDE, 1868)**  
(Pl. 2: HERITSCH, Pl. VI, Fig. 653)

1929 *Orthoceras praevalens* BARRANDE – HERITSCH, 57–58, Fig. 653.

Description: As given by HERITSCH (1929).

Remarks: The specimen possesses the diagnostic ornament of *Parakionoceras* FOERSTE and even if only a fragment of the phragmocone is preserved it may be compared specifically to *Orthoceras originale* BARRANDE in the chamber length and position of the siphon.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/147b.

***Parakionoceras striatopunctatum* (BARRANDE, 1868)**  
(Pl. 2: HERITSCH, Pl. VI, Figs. 672–674; STACHE Pl. VII, Fig. 19)

1868 *Orthoceras striatopunctatum* MÜNSTER – BARRANDE, Pl. 268.

1870 *Orthoceras striatopunctatum* MÜNSTER – BARRANDE, Pl. 427.

1874 *Orthoceras striatopunctatum* MÜNSTER – BARRANDE, 231.

1929 *Orthoceras striatopunctatum* MÜNSTER – HERITSCH, 58, Figs. 672–674.

1977 *Parakionoceras striatopunctatum* (BARRANDE) – KOLEBABA, 134.

Description: As given by HERITSCH (1929).

Remarks: The specimen has the distinctive ornament of *Parakionoceras* FOERSTE and differs from *P. originale* (BARRANDE) in the lack of any transverse ornament of the shell surface.

Occurrence: Kokberg, Roter Kalk (Wenlock /Ludlow).

Occurrence outside the Carnic Alps. Silurian of Bohemia.

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/148.

***Parakionoceras* sp.**

(Pls 1, 4: HERITSCH, Pl. V, Figs. 562–565; STACHE, Pl. II, Figs. 9, 10a–d)

1929 *Orthoceras dorulites* BARRANDE – HERITSCH, 21, Figs. 562–565.

Description: As given by HERITSCH (1929).

Remarks: The specimens possess the diagnostic shell ornament of *Parakionoceras* FOERSTE but preserve too few features to allow a specific assignment. It must be noted that

the other figures of *Orthoceras dorulites* BARRANDE (HERITSCH, 1929, Pl. V, Figs 566–568; STACHE, Pl. II, Figs. 10e–g) are reproduced directly from BARRANDE and are not idealised figures as stated by HERITSCH (1929, 21).

Occurrence: Dienten, Schiefer (Ludlow).

Repository: Geologische Bundesanstalt, Vienna

Material studied: Three specimens – GBA 1929/1/26; GBA 1929/1/26a; GBA 1999/5/1.

5.2.1.2.3. Subfamily LEUROCYCLOCERATINAE SWEET, 1964  
Genus *Orthocycloceras* BARSKOV, 1972

Type species: By original designation *Orthocycloceras alayense* BARSKOV, 1972.

***Orthocycloceras cf. lynx* (BARRANDE, 1868)**

(Pls 2, 3, 6: HERITSCH, Pl. VI, Fig. 624; Pl. VII, Figs. 690, 731–732, 749–752; STACHE, Pl. VII, Figs 16, 20; Pl. IX, Figs. 6, 6b)

1929 *Orthoceras dulce* BARRANDE – HERITSCH, 62, Fig. 624.

1929 *Orthoceras cf. lunaticum* BARRANDE – HERITSCH, 62, Fig. 690.

1929 *Orthoceras* sp. – HERITSCH, 72, 73, Figs. 731–732, 749–752.

Description: As given by HERITSCH (1929).

Remarks: The specimen assigned by HERITSCH (1929) to *Orthoceras dulce* BARRANDE does not show the diagnostic "crenulated" ornament of that species. The conch of *Orthoceras lunaticum* BARRANDE is only partly annulated: even if the specimen assigned by HERITSCH (1929) to that species is only fragmentary it may be assumed that the whole conch was annulated therefore it is here assigned to *Orthocycloceras cf. lynx* (BARRANDE).

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Four specimens – GBA 1929/1/155; GBA 1929 /1/156; GBA 1929/1/189; GBA 1929/1/196.

***Orthocycloceras ? cf. subannulare* (MÜNSTER 1840)**

(Pls 2, 4: HERITSCH, Pl. VI, Figs. 610, 613–614; STACHE, Pl. II, Figs 23, 24, 28–28b)

1929 *Orthoceras subannulare* MÜNSTER – HERITSCH, 22, Figs. 610, 613–614.

Description: As given by HERITSCH (1929).

Remarks: The specimens are badly preserved but may be compared with *Orthoceras subannulare* MÜNSTER in the annulated conch form. They are placed tentatively in *Orthocycloceras* BARSKOV on the basis of the ornament of the conch.

Occurrence: Dienten, Schiefer (Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Three specimens – GBA 1929/1/28; GBA 1929/1/28a; GBA 1929/1/28c.

5.2.1.2.4. Subfamily SPHAERORTHO CERATINAE RISTEDT, 1968  
Genus *Hemicosmorthoceras* RISTEDT, 1968

### Plate 3:

Reproduced from Plate VII of HERITSCH, 1929, mag. X 90 %. Refer to Table 1 for specific determinations of the material figured.



Type species: By original designation *Hemicosmorthoceras laterculum* RISTEDT

***Hemicosmorthoceras* sp.**

(Pls 3, 6: HERITSCH, Pl. VII, Figs. 734, 738–745; STACHE, Pl. IX, Figs. 18–18c, 19–19c, 20–20c)

1929 *Orthoceras* sp. – HERITSCH, 72, 73, Figs 734, 738–745.

Description: As given by HERITSCH (1929).

Remarks: The material is badly preserved however, the ornament and conch form allow a tentative assignment to *Hemicosmorthoceras* RISTEDT. New detailed research on the nautiloid fauna from this locality (SERVENTI, 1999) has highlighted a particular abundance of this genus.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna

Material studied: Three specimens – GBA 1929/1/191; GBA 1929/1/193; GBA 1929/1/193a.

5.2.1.3. Family ANASPYROCERATIDAE CHEN *In* CHEN, LIU & CHEN 1981

Genus *Calorthoceras* CHEN *In* CHEN, LIU & CHEN 1981

Type species: By original designation *Orthoceras pseudocalamiteum* BARRANDE, *In* QUENSTEDT, 1852,

***Calorthoceras* cf. *pseudocalamiteum*** (BARRANDE, 1852)

(Pls 2, 6: HERITSCH, Pl. VI, Figs. 625–627; STACHE, Pl. IX, Figs 1–1b)

1929 *Orthoceras dulce* BARRANDE – HERITSCH, 62, Figs. 625–627.

Description: As given by HERITSCH (1929).

Remarks: The ornament is distinctive of the species and is well preserved on this specimen. The rather rapid tapering rate of the conch however, is not so typical of *Orthoceras pseudocalamiteum* BARRANDE therefore the studied specimen is only compared to it.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/155a.

***Calorthoceras* aff. *pseudocalamiteum*** (BARRANDE, 1852)

(Pls 3, 5, 6: HERITSCH, Pl. VII, Figs. 683, 689; STACHE, Pl. VIII, Fig. 8; Pl. IX, Figs. 4, 5)

1929 *Orthoceras* cf. *bacchus* BARRANDE – HERITSCH, 58, Fig. 689.

1929 *Orthoceras venustum* BARRANDE – HERITSCH, 68, Fig. 683.

Description: As given by HERITSCH (1929).

Remarks: One specimen is badly preserved but the ornament is distinctive of *Orthoceras pseudocalamiteum* BARRANDE. It differs from *Orthoceras bacchus* to which it was assigned by HERITSCH (1929) in lacking longitudinal intermediate ribs between the main ribbing. The second speci-

men may not be included within *Orthoceras venustum* BARRANDE to which it was assigned by HERITSCH (1929) as this species has no ornament.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/149; GBA 1929/1/174.

5.2.1.4. Family GEISONOCERATIDAE ZHURAVLEVA 1959

Genus *Geisonoceras* HYATT, 1884

Type species: By original designation *Orthoceras rivale* BARRANDE, 1866.

***Geisonoceras* cf. *severum*** (BARRANDE 1866)

(Pls 3, 7: HERITSCH, Pl. VII, Figs. 711–713; STACHE, Pl. X, Figs. 6–6c)

1929 *Orthoceras* cf. *severum* BARRANDE – HERITSCH, 64, Figs. 711–713.

1986 *Geisonoceras severum* (BARRANDE) – MAREK & TUREK, 341.

Description: As given by HERITSCH (1929).

Remarks: The material studied possesses the transverse banded ornament typical of *Geisonoceras* HYATT but it may also be compared to *Orthoceras severum* BARRANDE.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/160; GBA 1929/1/160a.

***Geisonoceras* sp.**

(Pls 2, 4: HERITSCH, Pl. VI, Figs. 607–609; STACHE, Pl. II, Figs. 22–22c)

1929 *Orthoceras confraternum* BARRANDE – HERITSCH, 23, Figs. 607–609.

Description: As given by HERITSCH (1929).

Remarks: The specimen is badly preserved but the surface shows thick transverse bands, the siphuncle is subcentral and the chamber length about 1/3 the conch diameter. These features allow it to be placed within *Geisonoceras* HYATT.

Occurrence: Dienten, Schiefer (Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/31.

***Geisonoceras* ? sp.**

(Pl. 4: STACHE, Pl. II, Figs. 25, 25a)

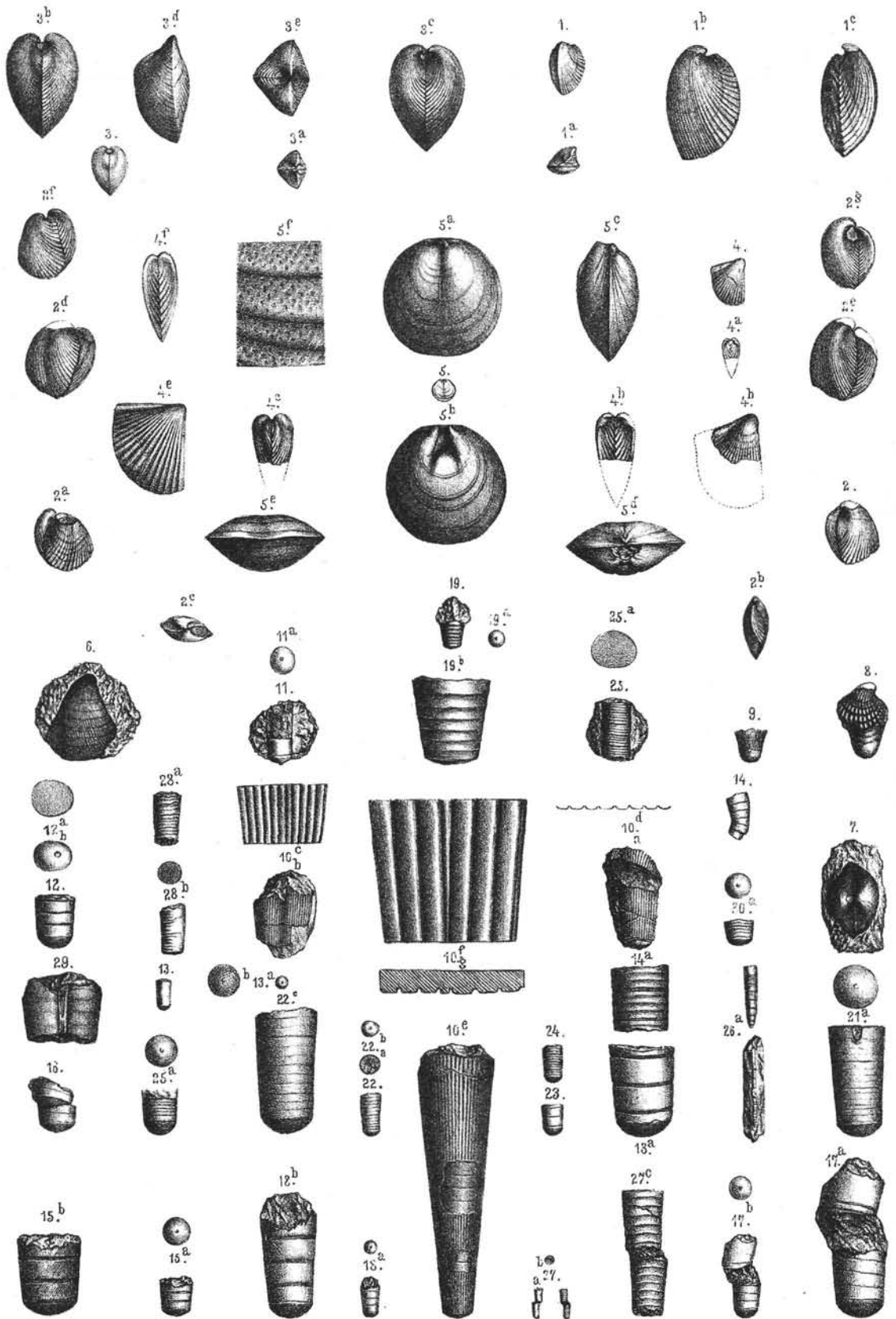
Remarks: The material is badly preserved but transverse bands on the surface allow it to be compared with *Geisonoceras* HYATT. Unfortunately STACHE figured two specimens on his unpublished plate II, both with the numbers 25, 25a.

The present description refers to the specimen on the right-hand side of the plate.

Occurrence: Dienten, Schiefer (Ludlow).

**Plate 4:**

Unpublished plate II of STACHE with the fauna from Dienten, Salzburg. Refer to Table 1 for specific determinations of the material figured.



A. Swoboda gez. u. lith.

Lith. Anst. v. Joh. Haupt, Wien.

Repository: Geologische Bundesanstalt, Vienna.  
Material studied: One specimen – GBA 1999/5/3.

Genus *Arionoceras* BARSKOV, 1966

Type species: *Orthoceras affine* MENEHINI, 1857.  
By subsequent designation SERPAGLI & GNOLI 1977.

***Arionoceras affine* (MENEHINI, 1857)**

(Pls 2, 3, 5: HERITSCH, Pl. VI, Figs. 679–680;  
Pl. VII, Figs. 681–682;  
STACHE, Pl. VIII, Figs. 3, 3a, 4, 4a)

- 1857 *Orthoceras affine* – MENEHINI, 217–218, Pl. C, Fig. 16.  
1929 *Orthoceras arion* BARRANDE – HERITSCH, 69, Figs. 679–682.  
1977 *Arionoceras affine* (MENEHINI) – SERPAGLI & GNOLI, 182–183, Pl. 6, Figs. 2a–7, Text–Fig. 10b.  
1998 *Arionoceras affine* (MENEHINI) – GNOLI & HISTON, 324–325, Pl. 2, Figs. 2a, b

Description: As given by HERITSCH (1929).

Remarks: Both specimens possess the specific characters of *Arionoceras affine* (MENEHINI) with internal features well preserved. The genus *Arionoceras* BARSKOV is placed under GEISONOCERATIDAE ZHURAVLEVA in this study rather than in ARIONOCERATIDAE DZIK.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/176; GBA 1929/1/176a.

***Arionoceras aff. affine* (MENEHINI, 1857)**

(Pls 3, 7: HERITSCH, Pl. VII, Fig. 700; STACHE, Pl. X, Fig. 17)

- 1929 *Orthoceras firmum* BARRANDE – HERITSCH, 65–66, Fig. 700.

Description: As given by HERITSCH (1929).

Remarks: The slender form and ornament together with the chamber length are all suggestive of *Arionoceras affine* (MENEHINI) to which the specimen is tentatively assigned.

Occurrence: Kokberg, Scharzen Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/166a.

***Arionoceras* sp.**

(Pls 2, 3, 5, 6: HERITSCH, Pl. VI, Fig. 678; Pl. VII, Fig. 699;  
STACHE, Pl. VIII, Fig. 2; Pl. IX, Fig. 23)

- 1929 *Orthoceras littorale* BARRANDE – HERITSCH, 63–64, Fig. 678.

- 1929 *Orthoceras firmum* BARRANDE – HERITSCH, 65–66, Fig. 699.

Description: As given by HERITSCH (1929).

Remarks: Both specimens are assigned to this genus on the basis of conch form and chamber length. Few other features are preserved however, the similarity to *Arionoceras* BARSKOV is quite marked.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/159; GBA 1929/1/166.

***Arionoceras* ? sp.**

(Pls 3, 6: HERITSCH, Pl. VII, Fig. 701, 723–727; STACHE, Pl. IX, Figs. 22–22d)

- 1929 *Orthoceras firmum* BARRANDE – HERITSCH, 87, Fig. 701.

- 1929 *Orthoceras* sp. – HERITSCH, 71, Figs. 723–727.

Description: As given by HERITSCH (1929).

Remarks: Both specimens are now badly preserved and may only be assigned with doubt to *Arionoceras* BARSKOV based on the slender conch form and the position of the siphuncle.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Cellonetta, Cardiola Niveau (Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/247; GBA 1929/1/186.

Genus *Columenoceras* BARSKOV, 1960

Type species: By original designation *Orthoceras columen* BARRANDE, 1868.

***Columenoceras* cf. *agassizi* (BARRANDE, 1866)**

(Pls 3, 6: HERITSCH, Pl. VII, Figs. 692–694; STACHE, Pl. IX, Figs 14–14b)

- 1929 *Orthoceras* cf. *agassizi* BARRANDE – HERITSCH, 59, Figs 692–694.

Description: As given by HERITSCH (1929).

Remarks: The central siphuncle and and transverse striae with low annulations allow the specimen to be compared with *Columenoceras agassizi* (BARRANDE). HERITSCH (1929) reproduced STACHE's figure of the ornament but unfortunately incorrectly oriented thus giving the impression that the specimen has longitudinal ribs.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/151.

***Columenoceras* sp.**

(Pls 3, 6, 7: HERITSCH, Pl. VII, Figs 717 – 718, 720 – 722;  
STACHE, Pl. IX, Figs 16 – 16c; Pl. X, Figs 5, 5a)

- 1929 *Orthoceras* sp. – HERITSCH, 71, Figs 717 – 718, 720 – 722.

Description: As given by HERITSCH (1929).

Remarks: The features preserved allow the specimens to be assigned to *Columenoceras* BARSKOV on the basis of expansion rate and cameral length but however, not to be given a specific determination.

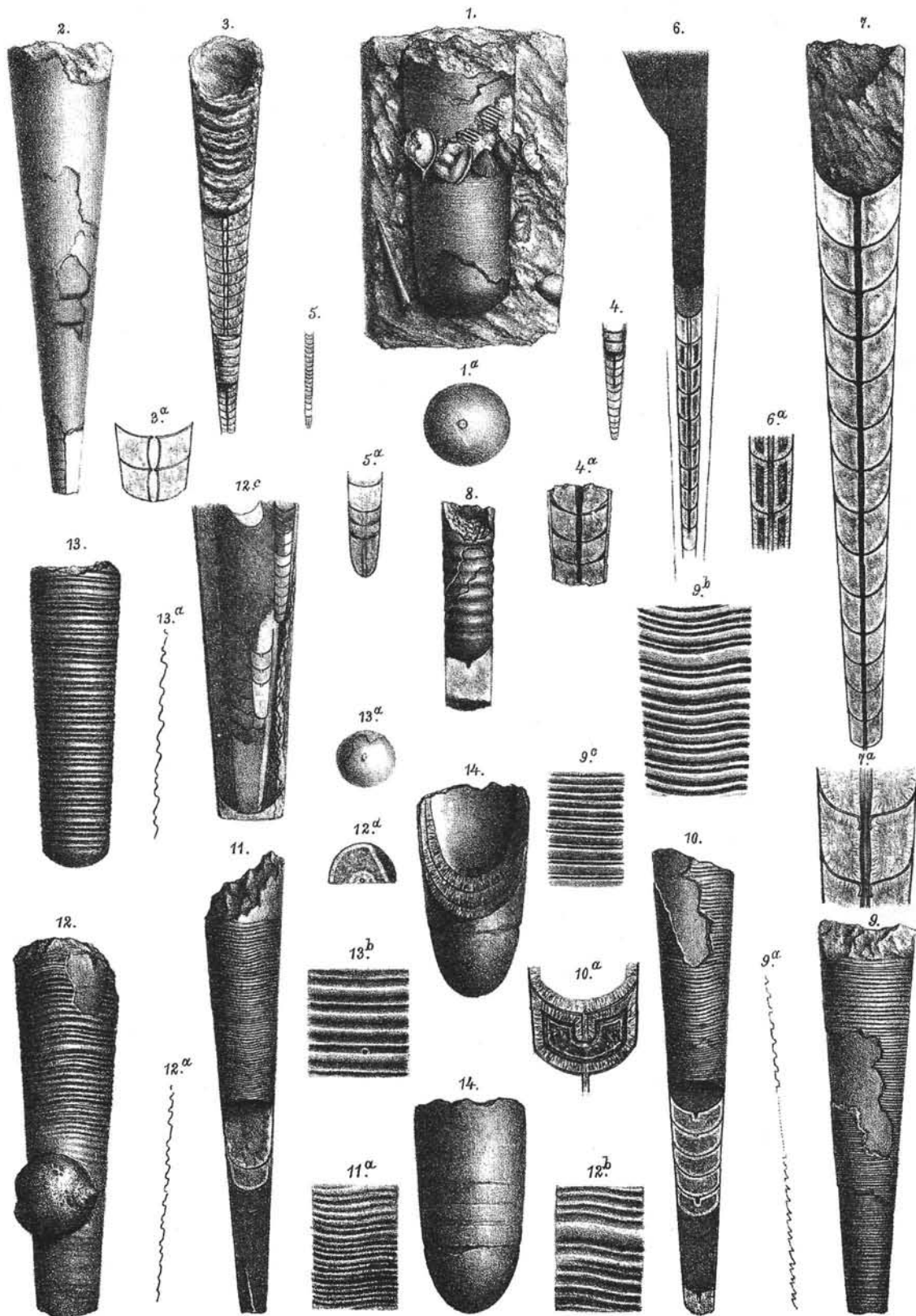
Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow), Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/183; GBA 1929/1/185.

**Plate 5:**

Unpublished plate VIII of STACHE with the fauna from Kokberg, Carnic Alps. Refer to Table 1 for specific determinations of the material figured.



A. Swoboda gez. u. lith.

Lith. Anst. v. Joh. Haupt, Wien.

5.2.1.5. SUPERFAMILY PSEUDORTHOCERATAEAE  
FLOWER & CASTER, 1935

5.2.1.6. FAMILY PSEUDORTHOCERATIDAE  
FLOWER & CASTER, 1935

5.2.1.6.1. Subfamily SPYROCERATINAE SHIMIZU & OBATA, 1935

Genus *Pseudocycloceras* BARSKOV, 1959

Type species: By original designation

*Pseudocycloceras karanglense* BARSKOV

***Pseudocycloceras cf. transiens* (BARRANDE 1866)**

(Pls 1, 5: HERITSCH, Pl. V, Figs. 588–590;

STACHE, Pl. VIII, Figs. 12–12d)

1929 *Orthoceras amoenum* BARRANDE – HERITSCH, 61, Figs. 588–590.

Description: As given by HERITSCH (1929).

Remarks: The transverse ornament of the specimen is too pronounced to be attributed to *Orthoceras amoenum* BARRANDE (HERITSCH, 1929) but may be compared with *Pseudocycloceras transiens* (BARRANDE).

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/153.

***Pseudocycloceras aff. transiens* (BARRANDE 1866)**

(Pl. 2: HERITSCH, Pl. VI, Figs. 668 – 671;

STACHE, Pl. VII, Fig. 17)

1929 *Orthoceras transiens* BARRANDE – HERITSCH, 57, Figs. 668–671.

Description: As given by HERITSCH (1929).

Remarks: The specimens are badly preserved and only the ornament and conch form allow a doubtful assignment to *Pseudocycloceras transiens* (BARRANDE).

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/146; GBA 1929/1/146a.

***Pseudocycloceras ? cf. conviva* (BARRANDE 1870)**

(Pls 3, 6: HERITSCH Pl. VII, Fig. 691; STACHE Pl. IX, Fig. 9)

1929 *Orthoceras cf. conviva* BARRANDE – HERITSCH, 57, Fig. 691.

Description: As given by HERITSCH (1929).

Remarks: Only the body chamber is preserved in this specimen but the transverse ornament allows a tentative assignment to *Pseudocycloceras* BARSKOV. The specimen may be compared with *Orthoceras conviva* BARRANDE again based on the ornament preserved.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/145.

***Pseudocycloceras ? sp.***

(Pl. 3: HERITSCH, Pl. VII, Figs. 729–730; STACHE, Pl. VII, Fig. 18)

1929 *Orthoceras* sp. – HERITSCH, 72, Figs. 729–730.

Description: As given by HERITSCH (1929).

Remarks: Only a fragment of body chamber is preserved but the ornament and conch form are suggestive of *Pseudocycloceras* BARSKOV.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/188.

5.2.2. Order ONCOCERIDA FLOWER *In* FLOWER & KUMMEL, 1950

5.2.2.1. Family ONCOCERATIDAE HYATT, 1884

Genus *Oocerina* FOERSTE, 1926

Type species: By original designation

*Cyrtoceras lentigradum* BARRANDE, 1866.

***Oocerina ? sp.***

(Pl. 3: HERITSCH, Pl. VII, Figs. 764–767;

STACHE, Pl. VII, Figs. 5–5b )

1929 *Cyrtoceras cycloideum* BARRANDE – HERITSCH, 56, Figs. 764–767.

Description: As given by HERITSCH (1929).

Remarks: The cyrtoconic conch form, closely spaced sutures and exogastric trace of the actinosiphonate siphuncle allow a tentative comparison with *Oocerina* FOERSTE. However, the specimen is not well preserved and a specific assignment is not possible.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/140.

5.2.3. Order BARRANDEOCERIDA FLOWER

*In* FLOWER & KUMMEL, 1950

5.2.3.1. Family BARRANDEOCERATIDAE FOERSTE, 1925

Genus *Barrandeoceras* HYATT, 1884

Type species: By original designation *Nautilus natator*

BILLINGS, 1859

***Barrandeoceras ? sp.***

(Pl. 3: HERITSCH, Pl. VII, Figs. 762–763;

STACHE, Pl. VII, Figs. 2, 3)

1929 *Barrandeoceras cf. sacheri* BARRANDE – HERITSCH, 74, Fig. 762.

1929 *Barrandeoceras* sp. – HERITSCH, 74, Fig. 763.

Description: As given by HERITSCH (1929).

Remarks: The specimens have a symmetrically coiled conch, ventrolateral shoulders are developed and the outline of sutures may be seen through the quite thin test. In one specimen (Fig. 762) the initial whorl is present but badly preserved.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: Two specimens – GBA 1929/1/200a; GBA 1929/1/201.

**Plate 6:**

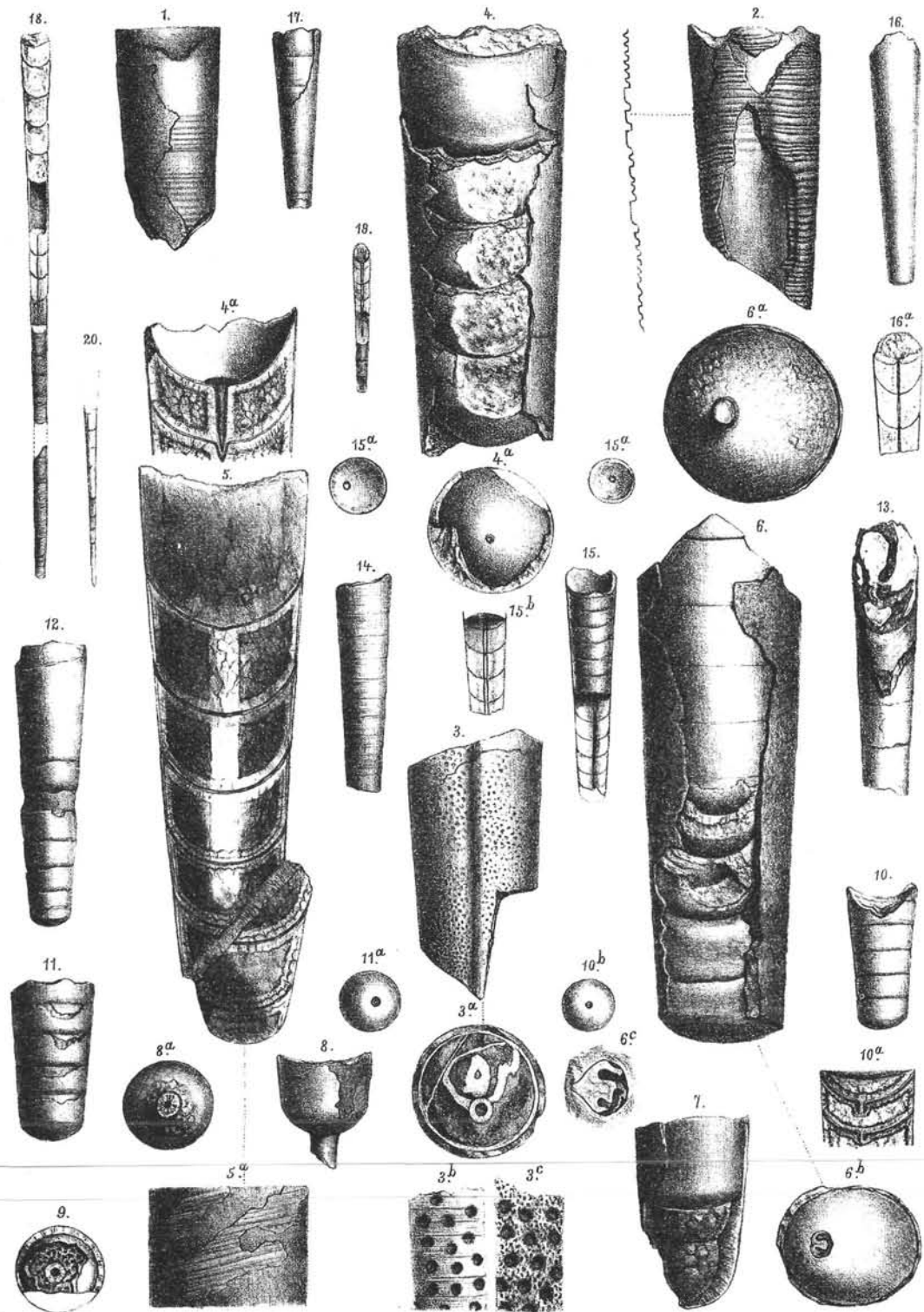
Unpublished plate IX of STACHE with the fauna from Kokberg, Carnic Alps. Refer to Table 1 for specific determinations of the material figured.





A Swoboda gez. u. lith.

Lith. Anst. v. Joh. Haupt, Wien



A. Swoboda gez. u. lith.

Lith. Anst. v. Joh. Haupt Wien.

Abhandlungen der k.k. Geologischen Reichsanstalt Band XVI

Plate 7:

Unpublished plate X of STACHE with the fauna from Kokberg, Carnic Alps. Refer to Table 1 for specific determinations of the material figured. (Abhandlungen der k.k. Geologischen Reichsanstalt Band XVI.)

5.2.3.2. Family URANOCERATIDAE HYATT In ZITTEL, 1900

Genus *Uranoceras* HYATT, 1884

Type species: By original designation *Cyrtoceras uranum*  
BARRANDE 1866

*Uranoceras* ? sp.

(Pl. 3: HERITSCH, Pl. VII, Figs. 768–773; STACHE, Pl. VII, Fig. 8)

1929 *Cyrtoceras circumflexum* BARRANDE – HERITSCH, 56,  
Figs. 768–773.

Description: As given by HERITSCH (1929).

Remarks: Transverse striae are well preserved on what seems to be a fragment of the body chamber. Internally the specimen is recrystallised and no trace of the siphuncle is seen even if this is shown by HERITSCH on Fig. 771. The loosely coiled conch is tentatively compared with *Uranoceras* HYATT.

Occurrence: Kokberg, Roter Kalk (Wenlock/Ludlow).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/139.

5.2.3.3. Family LECHRITROCHERATIDAE FLOWER

In FLOWER & KUMMEL, 1950

Genus *Lechritrochoceras* FOERSTE, 1926

Type species: By original designation

*Trochoceras desplainensis* MCCHESENEY, 1860

*Lechritrochoceras* cf. *hoernesii* (BARRANDE, 1865)

(Pl. 3: HERITSCH, Pl. VII, Figs. 754–758; STACHE, Pl. VII, Figs. 4–4c)

1929 *Trochoceras carinthiacum* – STACHE In HERITSCH, 74,  
Figs. 754–758.

Description: As given by HERITSCH (1929).

Remarks: The prominent annulations, transverse ornament and deep hyponomic sinus of the trochonic shell allow the generic assignment to *Lechritrochoceras* FOERSTE. The transverse ornament of the conch is clearly visible however, slight crenulations on the transverse striae may indicate that a longitudinal ornamentation was also present. The specimen is quite well preserved and may be compared with the species *Trochoceras hoernesii* BARRANDE.

Occurrence: Kokberg, Schwarzer Kalk (Wenlock ?).

Repository: Geologische Bundesanstalt, Vienna.

Material studied: One specimen – GBA 1929/1/199.

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