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rates were not uniform. The higher rate of creation of accommodation space at Cenera resulted in a inbuilding geometry with little clinofom progradation prior to the drowning of the platform.

- (8) The fossil finds support the correlation of the rapid initial aggradation at Latemar with the deposition of starved, organic rich mudstones at the base of the "Buchenstein Beds" (i.e. the "Lower Plattenkalke"). On a larger scale, however, the origin and significance of strata rich in organic matter is less clear. The stratigraphic range of an interval with discrete bituminous layers at Monte San Giorgio overlaps only marginally with the range of the "Lower Plattenkalke" in the Dolomites.
- (9) The drowning of carbonate platforms in the eastern Dolomites and Carnia started somewhat earlier than the Anisian/Ladinian boundary. The demonstrably variable ages of pelagic sediments on top of different platform portions suggest an important role of tectonic subsidence in these phases of drowning.

## 8. Systematic descriptions

**Classification:** Except for the genus *Nevadites* the sequence of the ammonoid genera followed in the description is based on the classification by Tozer (1981 a, b). However, it is supposed that a detailed study of the suture line may better elucidate the relationships between genera than does the present classification which is based mainly on the ornamentation and the cross section as taxonomic characteristics. Because of its relatively simple suture line the new genus *Latemarites* is affiliated to the Danubitidae.

**Numeration and keeping:** The ammonoid and bivalve material dealt with in this paper is kept in the collection of the Palaeontological Institute and Museum of the University of Zurich (PIMUZ). The specimens are labelled with the prefix "PIMUZ" followed by a number (e.g. PIMUZ 7102). In the text and in tables but not in their legends the prefix is omitted.

Standard abbreviations used in tables are: D: diameter, H: whorl height, Hr: relative whorl height (in % of the diameter), MN: number of marginal nodes per half turn, LN: number of lateral nodes per half turn, P: primary ribs per half turn, U: umbilical width, UN: umbilical nodes per half turn, Ur: relative umbilical width (in % of the diameter), W: whorl width, Wr: relative whorl width (in % of the diameter).

### 8.1. Class Cephalopoda

Order **Ceratitida** HYATT, 1884

Superfamily **Ceratitaceae** MOJSISOVICS, 1879

#### 8.1.1. Family **Hungaritidae** WAAGEN, 1895

##### ***Hungarites*** MOJSISOVICS, 1879

##### **Remarks on *Hungarites* and *Parakellnerites* sensu lato:**

In several levels of the "Buchenstein Beds" as well as in Latemar Limestone and in a condensed interval on the northern paleoslope of the Cenera platform ceratitids occur which are characterized by a distinct external keel (at least on inner whorls) and prominent and sometimes elongated marginal tubercles. The umbilical wall of these ceratitids

is steep, perpendicular or even overhanging. The umbilical rim is sharply rounded and shows vague and radially elongated umbilical tubercles. On the flanks weak, slightly sinuous ribs with or without small lateral tubercles appear occasionally. Such ceratitids are provisionally referred to in this paper as *Parakellnerites* sensu lato.

The authors are convinced, that *Parakellnerites* in this very broad sense is no monophyletic unit. Additional well preserved bedrock material with suture lines is needed to elucidate the relationships in this group. Thereafter it may be possible to define several genera or at least subgenera. For the time being it is necessary to distinguish these *Parakellnerites* from *Hungarites* (type species: *Hungarites zalaensis* resp. *mojsisovicsi*, see remarks on *Hungarites zalaensis*). The latter genus is characterized by a prominent keel and a more or less sharp, uninterrupted acute marginal edge at least on the inner whorls. Marginal tubercles are usually absent. If present, they are weak and obliquely elongated. Lateral tubercles do commonly not occur.

The morphological gap between several representatives of *Parakellnerites* sensu lato and *Hungarites* is very small. *Ceratites lenis* HAUER, 1896 is considered to be a *Hungarites* because of its uninterrupted marginal edges with very weak marginal tubercles. However, similar forms such as *Ceratites boeckhi* ROTH, 1871 are referred to *Parakellnerites*. The generic separation of these two species seems to be arbitrary, likewise is the allocation to two families (Hungaritidae and Ceratitidae).

The problem of the origin of different species of the genus *Hungarites* cannot be dealt with in this paper. However, it appears that *Hungarites* and, in addition, the family Hungaritidae are no phylogenetic units, but a rather heterogeneous group, in which several descendants of the Ceratitidae are united. This was also indicated by Tozer (1981 a, b), who affiliated to Hungaritidae several genera established by Parnes (1975) for Ceratitidae of Israel (*Paraceratitoides* and *Gevanites*) and *Iberites* HYATT, 1900 (= *Israelites* PARNES, 1962).

### ***Hungarites zalaensis* (BÖCKH, 1872)**

Pl. 1, Figs. 1–8; Figs. 15 a, 15 b.

#### **Synonymy:**

- ? 1871 *Ceratites Mojsisovicsi* Böckh M. S. – ROTH: A Felső-Örs melletti Forráshegy lejtőjének geologiai atmet-szete, p. 213 (without Fig.).
- \* 1872 *Ceratites Zalaensis* – BÖCKH: A Bakony déli részének földtani viszonyai, p. 140, 145–146, Pl. 7, Figs. 1–2.
- 1873 *Ceratites Zalaensis* – BÖCKH: Die geologischen Verhältnisse des südlichen Theiles des Bakony (German translation of Böckh 1872), p. 150 + 155, Pl. 7, Figs. 1–2.
- 1874 *Cer. Zalaensis* Böckh – BÖCKH: Die geologischen Verhältnisse des südlichen Theiles des Bakony, II. Theil, p. 176.
- 1879 *Trachyceras Zalaense* Böckh – MOJSISOVICS: Die Dolomit-Riffe von Südtirol und von Venetien, p. 53.
- 1882 *Hungarites Mojsisovicsi* (Boeckh) E. v. M. – MOJSISOVICS: Die Cephalopoden der mediterranen Triasprovinz, p. 222, Pl. 7, Fig. 6 and Pl. 8, Fig. 3.
- 1882 *Hungarites emiliae* E. v. Mojsisovics – MOJSISOVICS: *ibid.*, p. 223, Pl. 8, Fig. 8.
- 1989 *Hungarites cf. mojsisovicsi* (Roth) – VÖRÖS & PALFY: The Anisian/Ladinian boundary in the Vászoly section (Balaton Highland, Hungary), p. 23, Pl. 1, Fig. 4.
- 1989 *Hungarites mojsisovicsi* (Roth) – VÖRÖS & PALFY: *ibid.*, p. 23–25, Pl. 2, Fig. 2.

#### **Remarks on the nomenclature and synonymy of *Hungarites zalaensis*:**

Roth (1871) mentioned a new species *Ceratites mojsisovicsi*. No figure was given for this ammonoid and therefore the name is not valid. In 1872 Böckh, referring to the paper of

Roth illustrated the specimen but explicitly called it *Ceratites zalaensis*. In 1879 Mojsisovics first cited *Trachyceras zalaense* but introduced three years later (1882), without giving any explanation, the name *Hungarites Mojsisovicsi* (Boeckh).

Representatives of *Hungarites* occur frequently at the "Lastei di Valsorda" locality in the Latemar platform. Small specimens from this outcrop are identical with *Hungarites emiliae* MOJS. from blocks in the scree of Latemar Limestone near Forno (type locality). Larger specimens from the same layers at "Lastei di Valsorda" correspond to *Hungarites zalaensis* from the Balaton Highland. Therefore *Hungarites emiliae* MOJS. is considered as a younger synonym of *Hungarites zalaensis* (BÖCKH).

**Description:** On the inner whorls *Hungarites zalaensis* shows a narrow umbilicus with perpendicular umbilical wall. On the last whorl the umbilical width increases by an obvious egression of the umbilical spiral. The ornamentation of the flanks consists of more or less irregularly arranged swellings. In small individuals this form has rounded tubercles at the umbilical shoulder. On the outer third of the flank the swellings disappear. Up to a diameter of 9 to 10 cm the uninterrupted marginal edge and the ventral keel are well developed and separated by a concave zone of the inclined external surface. On the adult body chamber the marginal edge and the keel disappear, and at its end the external side is rounded. It is noteworthy that neither lateral nor marginal nodes appear in these hungaritids.

The representatives of *Hungarites zalaensis* of the lower part of the fossiliferous interval at "Lastei di Valsorda" differ somewhat from those of the middle portion (3 m higher up). The latter show only weak or no umbilical tubercles. Their cross section is narrower and the umbilical wall is not as high as in the former specimens. Although these differences seem to have no exceptions an additional species or subspecies is not established here.

A corroded fragment of *Hungarites* (7011) from the 58.4 m-level at Bagolino is referred to *Hungarites zalaensis* too. Interestingly this fragment reveals a suture line, a feature which is usually not visible in specimens from the Latemar Limestone.

### *Hungarites* cf. *plicatus* (HAUER, 1896)

Pl. 2, Figs. 1–4, 8–9; Figs. 15c, 16a–16c.

Seven hungaritids from layer 4 of the section "Punta di Zonia," described by Cros & Houel (1983, p. 441, Fig. 7B) are dealt with open nomenclature and compared with *Hungarites plicatus* (HAUER, 1896).

The whorl section of these forms is high-triangular with an acute, uninterrupted marginal edge and a distinct keel on the roof-shaped ventral side. The umbilicus is

**Table 1:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur
7017	48.9	26.2	53.6	c13.	26.6	7.	14.3
7012 (Pl.2, Fig.1)	42.6	23.	54.0	11.	25.8	6.5	15.3
7015 (Pl.2, Fig.4)	30.	14.8	49.3	7.8	26.0	6.6	22.0
<i>C. (H) plicatus</i> *	48.	26.4	55.	14.9	31.	5.3	11.
<i>C. (H.) semiplicatus</i> *			50.		29.		20.

\* Measurements reported by HAUER (1896)

narrow and its wall perpendicular to slightly overhanging. Up to a diameter of about 5 cm rectiradiat rib-like swellings are developed. These start at the umbilical edge with more or less distinct, rounded umbilical tubercles and become successively weaker somewhat outside the middle of the flank. The umbilical tubercles of the inner whorls are visible on the umbilicus. The suture line (Figs. 16 a–16 c) is ceratitic to subammonitic and shows 5 lobes on the flank.

The form can be distinguished from *Hungarites plicatus* by its narrower whorl section and its somewhat wider umbilicus.

**Occurrence and age:** Known from Punta di Zonia, north of Cernerera, central Dolomites, associated with *Parakellnerites zoniaensis* n. sp. and *Aplococeras avisianus*. Reitzi-Kellnerites Zone.

***Hungarites lenis* (HAUER, 1896)**

Pl. 2, Figs. 5–7.

Five specimens of *Hungarites lenis* were found in the “transitional beds” of Bagolino (54.25 m). The largest complete but slightly deformed specimen (7019) with a diameter of 10.63 cm corresponds well to the holotype, figured by Hauer (1896; Pl. &, Figs. 1, 2).

At the onset of the last whorl the distinct marginal edge is slightly undulated by very weak, obliquely elongated, short marginal swellings. The external side is roof-shaped with a distinct keel. The umbilical wall is slightly overhanging. The umbilical rim is smooth and shows rounded, irregularly arranged umbilical swellings which lead to indistinct ribs on the inner part of the flanks. At the last quarter of the body chamber the shell shows slightly sinuous lines on the flanks. The external side becomes roof-shaped with a low, rounded medium swelling, instead of the keel on inner whorls. The umbilical spiral has a distinct egression on the last whorl.

**Table 2:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur
7019 (Pl.2, Fig.5)	106.3	47.9	45.1	26.5	24.9	22.	20.7
ibid.	76.2	37.1	48.7	c21.	27.5	13.3	17.5
7022	70.	36.3	51.9	19.2	27.4	9.5	13.57
7020 (Pl.2, Figs.6-7)	46.6	23.5	50.5	11.9	25.5	8.6	18.5

A second, not complete specimen (7022) with a restored diameter of about 7.0 cm has a narrow keel on the external side. The marginal edge is undulated by weak, densely arranged, oblique marginal swellings. The section of the whorls is wedge-shaped with a largest width close to the umbilical rim. The umbilicus is very narrow.

A third specimen (7020, pl. 2, Figs. 6–7; with a maximum diameter of 4.8 cm) shows at a diameter of 4.0 cm a fundamental change in the ornamentation. In the inner part the ornamentation consists of distinct marginal tubercles and slightly sinuous ribs on the flanks. At a diameter larger than 4 cm the ribbing becomes weak and indistinct and the marginal tubercles are transformed to low, densely arranged marginal swellings.

**“*Hungarites*” cf. *lenis* (HAUER, 1896)**

Pl. 5, Figs. 1–2.

One specimen (7048) from the same interval (Bagolino 53.8 m) as *Hungarites lenis* differs from this species by having small lateral nodes. These nodes are easily visible on the last but one quarter of the outer whorl. They are also present at a diameter of about 4 cm as can be seen on the left side of the shell. The ornamentation of the inner whorls up to a diameter of about 5.5 cm consists of sinuous ribs which start as rounded umbilical tubercles, bear weak lateral nodes slightly inside the middle of the flank and terminate with distinct, obliquely elongated marginal tubercles. The ventral side is roof-shaped.

**Table 3:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur
7048 (Pl.5, Figs.1-2)	98.0	50.4	51.4	c24	24.5	17.4	17.7
ibid.	50.7	26.7	52.7	-	-	8.7	17.2

Due to the coarser ornamentation of the inner whorls this form shows great similarity with a small specimen of *Hungarites lenis*, figured in Hauer (1896, Pl. 6, Figs. 3–6).

**Hungaritidae gen. et sp. indet.**

Pl. 5, Fig. 6.

Two involute ammonoids preserved as siliceous pseudomorphs in the “transitional beds” of Pètica can, for the time being, not be attributed to a genus or a species.

Considering the cross section the larger specimen (7055, Pl. 5, Fig. 6) shows some similarity with *Hungarites lenis* (HAUER) and *Parakellnerites arthaberi* (DIENER). However, the ventral side is rounded and has no median keel. A distinct marginal edge is also missing. The umbilical wall is steep, but not completely perpendicular, and the umbilical shoulder is sharply rounded with no tubercles. On the inner whorls (up to a diameter of about 3 cm) feeble, slightly sinuous ribs (primaries branching somewhat outside the middle of the flanks, and intercalatories) are developed. On the innermost part of the flank the ribs are very weak or absent. The outer whorls show no ornamentation. The suture line preserved on one septum shows the lateral lobe and three lobes of decreasing length on the flank. In the small individual (7056), the saddles are weakly denticulated and therefore the suture line seems to be ammonitic.

The open nomenclature applied to these ammonoids may change after a thorough study of the Hungaritidae and the Ceratitidae (see also the remarks on *Hungarites* and *Parakellnerites sensu lato*).

**Table 4:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur	HW
7055 (Pl.5, Fig.6)	35.3	19.6	55.4	11.5	32.5	4.8	13.59	1.70
7056	22.8	12.4	54.3	8.0	34.9	4.8	21	1.55
<i>H. lenis</i> (7020, Pl.2, Figs.6-7)	46.6	23.5	50.5	11.9	25.5	8.6	18.5	1.97
<i>P. arthaberi</i> (7024, Pl.2, Figs.10-11)	44.0	21.6	49.0	11.7	26.5	10.0	27.7	1.85

8.1.2. Family **Ceratitidae** MOJSISOVICS, 1879***Parakellnerites* RIEBER, 1973*****Parakellnerites arthaberi* (DIENER, 1899)**

Pl. 2, Figs. 10–11, Pl. 12, Figs. 7; Fig. 16f.

Two relatively complete specimens and a fragment from the Bagolino section show great similarities with *Hungarites arthaberi* DIENER with respect to their ornamentation, the whorl section, and the suture line. Because the type specimen of this species is not available these ammonoids are provisionally referred to as *Parakellnerites arthaberi*. The specimen 7025 (Pl. 12, Fig. 7) with a largest diameter of 7.58 cm consists of the phragmocone with a part (arc of 90°) of the body chamber. The ventral side is roof-shaped and separated from the flanks by an acute ventral shoulder. The latter is accentuated by spirally elongated marginal tubercles. On the flanks weak, slightly prosiradiate ribs are developed. These start at the umbilical rim with small swellings, bear the marginal tubercles and cross as very feeble, obliquely arranged ribs the external surface before reaching the keel. The suture line of this specimen (Fig. 16f) is consistent with the line figured by Diener (1899, Pl. 1, Fig. 3).

The second specimen (7024, Pl. 2, Figs. 10–11) with a diameter of 7.25 cm has a weaker ornamentation. The ribbing is slightly sinuous and considering its arrangement it corresponds well to that of the holotype. As a result of a slightly concave external surface the keel and the ventral shoulder are more distinct on the inner whorls.

**Table 5:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur
7024 (Pl.2, Figs.10-11)	72.5	36.7	50.6	20.8	28.7	13.1	18.1
ibid.	44.0	21.6	49.0	11.7	26.5	10.0	27.7
7025 (Pl.12, Fig.7)	44.8	24.7	51.0	11.0	23.0	8.5	17.7

The fragment 7026 (Pl. 12, Fig. 10) shows low and broad ribs with very weak swellings on the internal mould of the body chamber. These swellings were also mentioned by Diener (1899, p. 9).

*Parakellnerites arthaberi* (DIENER) occurs in the “Transitional beds” at Bagolino around the 57.8 m-level. Its age is Reitzi/Kellnerites Zone.

***Parakellnerites zoniaensis* n. sp.**

Pl. 3, Figs. 1–10; Figs. 15d–15g, 16d.

**Synonymy:**?1982 *Ceratites hungaricus* Mojsisovics – BLENDINGER, PAROW & KEPPLER, p. 223.?1983 *Ceratites hungaricus* (Mojs.) – CROS & HOUEL, p. 435.

**Holotype:** Specimen 7033, figured in Pl. 3, Fig. 10. It is a well preserved, nearly complete individual. On the right side the shell is partly removed and the internal mould with the suture line is visible.

**Name:** Referring to the Punta di Zonia type locality.

**Locus typicus:** Small hill on the southern slope of Punta di Zonia north of Cenera, central Dolomites, Prov. Belluno/Italy.

**Stratum typicum:** Layer 4 of the section described by CROS & HOUEL (1983, p. 441, Fig. 7b) as “coquina – phosphatized biosparite with ammonites of the avisianus zone.” The writers assign this level to the Reitzi/Kellnerites Zone.

**Material:** Seven nearly complete specimens and six fragments from the locus typicus.

**Diagnosis:** Involute representative of *Parakellnerites* with perpendicular to slightly overhanging umbilical wall. Whorl section rounded subtrapezoidal to rounded subrectangular. Ventral shoulder and umbilical edge are distinct.

**Description:** The ornamentation varies during ontogeny and from specimen to specimen. In adult individuals (diameter with mature body chamber 7.5 to 8.5 cm) it consists of faint ribs which start at the umbilical edge with somewhat bullate umbilical nodes. The ribbing fades towards the outer part of the flank. Somewhat inside the middle of the flanks weak to strong lateral nodes are developed. The ventral shoulder carries regularly arranged and acute marginal nodes. These latter send short and faint ribs towards the inclined external side. The obliquely forward directed ribs accentuate the ventral shoulder. They vanish before reaching the ventral keel. In small individuals (7028, 7032; Pl. 3, Figs. 3 and 8) the ribs especially on the inner flank portions and the bullate umbilical nodes are elevated. The suture line (Fig. 16d) is typically ceratitic with three large denticulated lobes on the flank.

**Table 6:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur
7033 holotype (Pl.3, Fig.10)	7.24	3.16	43.6	2.11	29.1	1.55	21.4
ibid.	5.82	2.68	46.0	1.5	25.7	1.11	19.0
7027 (Pl.3, Figs.1-2)	7.59	3.7	48.7	2.14	28.2	1.5	19.8
ibid.	5.48	2.71	49.5	1.5	27.4	1.0	18.2
7031 (Pl.3, Figs.6-7)	6.12	2.8	45.75	1.6	26.1	1.36	22.2
ibid.	4.46	2.08	46.6	1.31	29.4	0.96	21.5

**Discussion:** *Parakellnerites hungaricus* (MOJS.) is similar to *Parakellnerites zoniaensis* but has no steep umbilical wall and its umbilicus is wider. On the basis of these characteristics the new species can be distinguished from the representatives of *Parakellnerites* from the “Grenzbitumenzone” at M. S. Giorgio (Rieber 1973 a). *Parakellnerites rothpletzi* shows a similar development of the umbilicus. It differs from *P. zoniaensis* by its more regular ribbing on the outer portion of the flank. The usually more numerous marginal nodes are arranged in a different way and the keel on the roof-shaped ventral side is less elevated than in *P. zoniaensis*.

**Occurrence and age:** Known only from the type locality; Reitzi/Kellnerites Zone.

### ***Parakellnerites rothpletzi* (SALOMON, 1895)**

Pl. 4, Figs. 1–17; Fig. 15h.

In the upper part of the fossiliferous interval at the “Lastei di Valsorda” locality (Latemar) ceratitids here referred to *Parakellnerites rothpletzi* (SALOMON) are abundant. The ornamentation of this species varies in wide ranges. The specimens are characterized

by a moderately narrow umbilicus with a wall perpendicular on the inner whorls to slightly overhanging on the outer ones. Marginal tubercles are obliquely elongated and form an undulated marginal edge. A sharply rounded keel sits on the roof-shaped ventral side and ribs of various elevations run across the outer half of the flank. Many specimens have lateral nodes. These fade on the outer whorls as do the marginal tubercles and the ventral keel. Von Bubnoff (1921) assigned the species *rothpletzi* to *Hungarites waageni* (MOJS., 1882).

He also noticed differences between the type of *Hungarites waageni* from the Marmolada, and his forms from the Latemar Limestone blocks near Forno. For this reason the latter were figured under the name “*Hungarites waageni* var. form *Rothpletzi* Salomon” (v. BUBNOFF 1921, p. 456, Pl. 12). There is no doubt, that the species *P. rothpletzi* (SALOMON) has to be separated from *Hungarites waageni*, which shows an undulated external keel – a feature already described by Mojsisovics (1882, p. 82). Moreover *Hungarites waageni* appears to be younger than *P. rothpletzi*.

#### ***Parakellnerites* aff. *rothpletzi* (SALOMON, 1895)**

Pl. 4, Fig. 18.

A ammonoid specimen (7046, Pl. 4, Fig. 18) from the “Lower Plattenkalke”, 2,2 m below the base of the “Knollenkalke” at Seceda can be compared with *Parakellnerites rothpletzi*. The specimen shows large, rounded umbilical tubercles (5 per half turn) sticking out towards the umbilicus. The ribs start with the umbilical tubercles and are relatively strong. They bear weak lateral nodes at one third of the whorl height. All ribs, primaries and secondaries, terminate at the ventrolateral shoulder with obliquely elongated, densely arranged marginal tubercles of equal size. The ventral side is low roof-shaped with a narrow median keel. The umbilical wall seems to be perpendicular or even overhanging.

Because of its strong umbilical and marginal tubercles this form can be distinguished easily from *Parakellnerites rothpletzi* itself. A small *Aplococeras* sp. is preserved on the same specimen.

#### ***Parakellnerites* ? *waageni* (MOJS., 1882)**

Pl. 4, Fig. 19.

Two specimens from the Marmolada north slope and now in the collection of the Museum of Predazzo, distinctly reveal the features of *Parakellnerites* ? *waageni* (Mojs.). The larger one, a cast of a mould, shows perfectly the undulated keel (pl. 4, Fig. 19). This feature led Mojsisovics to affiliate the species *waageni* to *Balatonites*. It is rather strange why v. Bubnoff (1921) assigned the species *rothpletzi* (SALOMON) with its uninterrupted median keel to the species *waageni* (MOJS.).

#### ***Lardaroceras* BALINI, 1992**

Several fragments of large and some small ammonoids from the “transitional beds” at Pèrtica are attributed to the genus *Lardaroceras* BALINI. Most of these ammonoids are preserved as siliceous pseudomorphs and could therefore be partly isolated from the hard grey siliceous limestone using diluted hydrochlorid acid.

The main features of these ammonoids are in agreement with those of *Lardaroceras krystyni* and *L. pseudohungaricum* described by Balini (1992a). However, there are also some pronounced differences. In the forms from Pèrtica the umbilicus is considerably wider. The ornamentation is weaker and fades earlier than in Balini's species from the Prezzo Limestone.

For the time being we treat these forms with open nomenclature. Additional material and studies are needed to describe in detail the forms from Pèrtica and to judge if there is just one species with a great intraspecific variability or several species with correspondingly smaller variabilities.

***Lardaroceras* aff. *pseudohungaricum* BALINI, 1992**

Pl. 5, Figs. 3, 11–12, 15.

**Diagnosis:** *Lardaroceras* with wide umbilicus and three rows of nodes. Ribs are weak or completely absent.

**Description and discussion:** The lateral nodes located somewhat outside the inner third of the whorl height can be distinct and pointed as in 7049 (Pl. 5, Figs. 11–12) or weak and low as in 7050 (Pl. 5, Fig. 3). As regards the whorl section and the number of rows of nodes these forms are similar to *L. pseudohungaricum*. However, they show no ribs on the flanks, and their umbilicus is wider than in the latter species.

**Occurrence and age:** Known only from the “transitional beds” at Pèrtica; Reitzi/Kellnerites Zone.

***Lardaroceras* aff. *krystyni* BALINI, 1992**

Pl. 5, Figs. 16–17.

**Diagnosis:** *Lardaroceras* with wide umbilicus, two rows of nodes (umbilical and marginal) and with low broad, slightly sinuous ribs.

**Description and discussion:** The single specimen differs from *L. aff. pseudohungaricum* by the absence of lateral nodes and the occurrence of ribs. Its umbilicus is relatively wide especially on the inner turns. The form is compared with *L. krystyni* because it has no lateral nodes. However, the ribbing differs considerably. The suture line which is preserved on one septum – perhaps the last one – shows three lobes on the flanks and is probably ammonitic. The saddles are apparently denticulated. However, because of the coarse grained silification of the septum it is difficult to distinguish between denticulation and a structure produced by diagenesis. Concerning the number of elements the suture line is in good agreement with that of *L. krystyni*.

**Occurrence and age:** As for *Lardaroceras* aff. *pseudohungaricum*.

***Lardaroceras* sp.**

Pl. 5, Figs. 4–5.

Two small specimens with features typical for the genus *Lardaroceras* cannot be attributed to or compared with a species. They show umbilical and marginal nodes, and weak, broad ribs.

**Occurrence and age:** The same as for *Lardaroceras* aff. *pseudohungaricum*.

**Table 7:**  
Dimensions (in mm and %) of several illustrated representatives of *Lardaroceras*:

Specimen	D	H	Hr	W	Wr	U	Ur	HW
7049 (Pl.5, Figs.11-12)	-	22.3	-	14.1	-	-	-	1.38
ibid.	16.0	6.8	42.3	5.1	31.7	5.1	31.6	1.33
7052 (Pl.5, Figs.16-17)	32.2	13.3	41.3	10.1	31.4	9.9	30.9	1.31
ibid.	22.1	8.7	39.4	-	-	7.8	35.4	-
7054 (Pl.5, Fig. 4)	20.6	8.6	41.7	6.1	29.4	6.1	29.6	1.42

### *Stoppaniceras* RIEBER, 1973

#### *Stoppaniceras evolutum* n. sp.

Pl. 9, Figs. 6, 7, 10; Fig. 151.

**Name:** Referring to the evolute shell of this species of *Stoppaniceras*.

**Holotype:** Specimen 7095, figured in Pl. 9, Fig. 10.

**Stratum typicum and locus typicus:** "Buchenstein Beds", lowermost layer of the "Knollenkalke" on the western slope at Seceda east of Ortisei (St. Ulrich, Val Gardena, Italy).

**Material:** Four specimens of which two are very fragmentary.

**Diagnosis:** Small, evolute *Stoppaniceras* with low subrectangular whorl section and a low, distinct median keel on the flat ventral side. The suture line shows on the flank two ceratitic lobes with denticulated bases.

**Description:** The ornamentation consists of primaries and intercalatories. Both type of ribs are slightly prosiradiate, especially on the outer part of the flank. The primaries start with small, rounded umbilical tubercles. A distinct umbilical wall is not developed. All ribs end at the ventrolateral shoulder with distinct nodes some of which are obliquely elongated. These marginal nodes tower slightly over the flat and smooth ventral side. The median keel is narrow and truncated.

**Table 8:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur	P	MN
7095, holotype (Pl.9, Fig.10)	38.3	12.1	31.6	-	-	17.4	45.4		
ibid.	33.9	10.7	31.7	c8.5	25.2	16.9	47.3	12	c20
7096, paratype (Pl.9, Figs.6-7)	29.4	9.0	29.4	c8.3	36.6	14.2	48.3	10	15

**Comparison and discussion:** *Stoppaniceras evolutum* n. sp. differs from *S. variabilis* by its wider umbilicus, its flat ventral side and the absence of lateral nodes and an umbilical wall.

The assignation of the genus *Stoppaniceras* to the Ceratitidae is not yet firmly established. It should be noticed that the suture line of *Stoppaniceras* shows only few elements.

**Occurrence and age:** *Stoppaniceras evolutum* n. sp. is known from the lower "Buchenstein Beds" at Seceda; oldest Nevadites Zone.

### *Kellnerites* ARTHABER, 1912

Specimens of the genus *Kellnerites* ARTHABER 1912 were found in the "transitional beds" at Bagolino and Pèrtica. At Bagolino they are commonly preserved as internal

moulds of the body chamber and as parts of the phragmocone. Removing these mechanically from the siliceous limestone beds is usually difficult or impossible. At Pèrtica the shells are partly silicified and could therefore be isolated using diluted hydrochloric acid.

Most of the specimens are attributed to *Kellnerites bosnensis* and *K. halilucensis* and to forms, which Hauer (1896) called *K. fissicostatus*, *K. angustecarinatus* and *K. ecarinatus*. However the three latter species may be varieties of *K. halilucensis* or *K. bosnensis*, as Hauer (1896, p. 255) already mentioned.

In all specimens from Bagolino the whorl width seems to be smaller than in the type specimens from Han Bulog and Haliluci in Bosnia. The ornamentation varies in wide ranges and its development depends obviously on the ontogenetic stage. The median keel also changes its shape. It may be narrow or low and broad or missing (especially in smaller individuals). Because we dispose of no sufficiently well preserved material, we refrain from giving a thorough study of the genus *Kellnerites*. Nevertheless a new species is established here for an unknown form.

***Kellnerites bagolinensis* n. sp.**

Pl. 6, Figs. 1–3, 9; Figs. 15 o, 16 e.

**Holotype:** Specimen 7061, figured in Pl. 6, Figs. 1–2. It is an internal mould with body chamber (a half turn). The well preserved right flank and external side are exposed, whereas the left side is crushed and covered with rock.

**Name:** Referring to the type locality Bagolino, Prov. Brescia, Italy.

**Locus typicus:** Small outcrop of “transitional beds” along a forest road on the southern slope (about 1250 m a.s.l.) of M. Pizza 1 km southwest from Bagolino/Romanterra.

**Stratum typicum:** Middle part of “transitional beds” (55.5 m).

**Material:** Two nearly complete specimens, two well preserved larger and several small and compressed fragments.

**Diagnosis:** Involute *Kellnerites* with 4 rows of nodes (umbilical, inner and outer lateral as well as marginal nodes), situated on weak, low and partly broadened ribs. The whorl section is rounded subrectangular with a steep, nearly perpendicular umbilical wall. The low, roof-shaped ventral side bears a narrow, distinct median keel. The suture line is ceratitic with three denticulated lobes on the flank.

**Description:** The number and strength of the nodes and ribs vary in wide ranges. The holotype is the most coarsely ornamented specimen of the type series. The primaries start at the sharply rounded umbilical shoulder with nodes, which are somewhat elongated radially. In the holotype some of inner umbilical nodes are paired. The position of the two rows of lateral nodes varies from one specimen to another. The spiral of the inner lateral nodes is situated in the holotype close to the middle, in specimen 7063 (Pl. 6,

**Table 9:**  
Dimensions (in mm and %):

Specimen	D	H	Hr	W	Wr	U	Ur	UN	LN1	LN2	MN
7061, holotype (Pl.6, Fig.1)	72.	31.6	43.9	c20.6	28.6	19.4	26.9	10	12	13	19
ibid.	68.2	30.4	44.6	c17.6	25.8	18.5	27.1	8	11	13	20
ibid.	49.5	21.1	42.6	c14.6	29.4	14.	28.2	9	-	-	18
7064	-	-	-	-	-	-	-	-	-	-	c32
<i>H. liepoldti</i> , holotype	63.	31.	49.2	17.	27.0	12.	19.0	6	6	7	c24

Fig. 9) however in the inner third of the flank. In specimen 7064 (not figured) even the spiral of the outer lateral nodes is situated in the inner half of the whorl height. The low ribs are rather broad, straight and rectiradiate in the holotype and thin, slightly sinuous and prosiradiate in specimen 7063 (Pl. 6, Fig. 9). Beside the primaries there are intercalatories of different length. All ribs bear more or less obliquely elongated marginal nodes.

**Discussion:** Especially the more densely ornamented specimens of the new species are similar to *Hyarpadites liepoldti* (MOJS., 1882) from Balaton area, Hungary. The narrow median groove indicated by Mojsisovics (1882, p. 53) for the type of *Hyarpadites liepoldti* is caused by preservation. In reality this species owns a median keel (pers. comm. by A. Vörös). The suture lines of *H. liepoldti* and of the new species from Bagolino are identical. *Kellnerites bagolinensis* shows a larger umbilicus than *H. liepoldti*.

The authors are convinced, that both species are closely related. Moreover there is no doubt that *K. bagolinensis* has to be assigned to the genus *Kellnerites*. Therefore the genus *Hyarpadites* Spath, 1951 appears to be unnecessary. If the genus *Hyarpadites* should not be abandoned, it would have to be integrated into the Ceratitidae.

**Occurrence:** Known only from the "transitional beds" at Bagolino. Closely related forms such as *Hyarpadites liepoldti* are known from the Balaton area, Hungary (Vörös et al., 1991, p. 44).

**Age:** Reitzi/Kellnerites Zone.

### ***Reitziites* n. gen.**

**Type species:** *Reitziites reitzi* (BÖCKH, 1872)

**Diagnosis:** Ceratitids with narrow and flattened venter, which is lined by obliquely elongated ventral tubercles. The rows on both sides of the latter are in nearly opposite to alternating positions. The inner whorls show distinct, slightly sinuous ribbing. On the outer whorls the ribbing becomes less sinuous. Marginal and, close to the umbilical edge, weak lateral tubercles appear. Between the marginal and ventral tubercles only low swellings are developed. The ribbing on the flanks shows some fibulations. On the inner whorls two ribs merge in a ventral node and on the outer whorls in a marginal node occasionally.

The suture line of *Reitziites* is ceratitic and shows two lobes on the flanks and a small third one on the umbilical edge.

**Remarks and Discussion:** The species *reitzi*, established by Böckh 1872, was first referred to the genus *Ceratites*, and later by Mojsisovics (1882) to *Trachyceras*. Frech (1903) and other authors called it *Trachyceras* (*Protrachyceras*) or *Protrachyceras*. Wang (1983) attributed it to *Xenoprotrachyceras* (genus introduced by him), and Brack & Rieber (1986) used *Nevadites* instead. During a reinvestigation of the specimens of the type series at the Hungarian Geological Institute and the study of new material from Bagolino we noted that especially the inner whorls of *reitzi* show no elements which are typical for the above mentioned genera. Therefore a new genus is established here.

The outer whorls of the most coarsely ornamented specimens from the Brescian Prealps resemble some representatives of *Nevadites*. It is therefore probable that the genus *Nevadites* has its origin in *Reitziites*. *Reitziites* in turn is very likely a descendant of *Kellnerites*.

**Composition of the genus:** *Reitziites reitzi* (BÖCKH), respectively *Ceratites reitzi* BÖCKH, *Trachyceras (Protrachyceras) cholnokyi* FRECH, 1903, and *Ceratites perauritus* DIENER, 1900.

**Occurrence and age:** Balaton Highland (Hungary) and Brescian Prealps (Bagolino, Pèrtica, Brozzo, Italy); upper part of the Reitzi-Kellnerites zone.

***Reitziites reitzi* (BÖCKH, 1872)**

Pl. 7, Figs. 1, 4–7, Pl. 8, Figs. 1–14, Pl. 11, Figs. 1–3; Figs. 15r, 15s, 17e, 17f.

**Synonymy:**

- \* 1872 *Ceratites Reitzi* n. sp. – BÖCKH, A Bakony déli részének földtani viszonyai: p. 147–148, Pl. 7, Fig. 3a, Pl. 8, Figs. 3b, 4, 5.
- 1873 *Ceratites Reitzi* n. sp. – BÖCKH, Die geologischen Verhältnisse des südlichen Theiles des Bakony. (German translation of Böckh 1872): p. 157.
- 1875 *Ceratites Reitzi* BÖCKH–STÜRZENBAUM, Adatok a Bakony Ceratites Reitzi – szíul fannájanak ismeretéhez: p. 256, Pl. 5, Figs. 2a + b.
- 1882 *Trachyceras Reitzi* (BÖCKH) – MOJSISOVICS, Die Cephalopoden der mediterranen Triasprovinz: p. 113, Pl. 7, Figs. 2–5.
- 1900 *Ceratites perauritus* nov. sp. – DIENER, Neue Beobachtungen über Muschelkalk-Cephalopoden des südlichen Bakony: p. 26, Pl. 2, Fig. 1.
- 1903 *Trachyceras Cholnokyi* n. sp. (*Protrachyceras*) – FRECH, Neue Cephalopoden aus den Buchensteiner ...: p. 8–9, Pl. 2, Figs. 5a, b.
- non 1986 Group of *Nevadites reitzi* (Böckh 1872) – BRACK & RIEBER, Stratigraphy and Ammonoids of the lower “Buchenstein Beds” of the Brescian Prealps and Giudicarie and their significance for the Anisian/Ladinian boundary: p. 200–201, Pl. 2, Fig. 2, Pl. 4, Fig. 4.
- 1989 *Xenoprotrachyceras cholnokyi* (FRECH) – VÖRÖS & PALFY, The Anisian/Ladinian Boundary: Pl. 3, Figs. 3a, b, 4a, b.
- 1989 *Xenoprotrachyceras reitzi* (BÖCKH) – *ibid.*: Pl. 3, Figs. 5a–c.
- non 1900 “*Protrachyceras*” *reitzi* (BÖCKH) – KOVACS et al., Conodont Biostratigraphy of Anisian/Ladinian Boundary ...: Pl. 3, Fig. 4.

**Lectotype:** Specimen figured by Böckh (1872), Pl. 7, Fig. 3a and Pl. 8, Fig. 3b, refigured by Mojsisovics 1882, Pl. 7, Figs. 2a, b. The type is kept in the Hungarian Geological Institute at Budapest.

**Locus typicus and stratum typicum:** According to Mojsisovics 1882 (p. 114 and Pl. 7): yellowish, cherty limestone at Felső-Örs in the “Bakonyerwalde,” Reitzi Zone.

**Material:** A total of 40 specimens (including 15 fragments) is available. 31 are from Bagolino, six from Avenone/Pèrtica and three from Brozzo.

**Diagnosis:** The same as for the genus *Reitziites*.

**Description:** The largest specimen (Pl. 7, Fig. 5) reaches at the end of the body chamber a diameter of 13.5 cm. The most typical feature of *Reitziites reitzi* is the alternation of the ornamentation during growth. Specimens with a diameter larger than 4 cm show usually ventral tubercles and more or less prominent marginal and umbilical tubercles which latter on the inner part of the flank are radially elongated. In specimens with a diameter less than 4 cm the marginal and lateral nodes are missing. Therefore the flanks bear ribs only. The ribs consist of primaries starting at the rounded umbilical rim in the vicinity of which most of them bifurcate.

The secondary, the few undivided primary and some intercalated ribs are slightly falcoid. They are all rectiradiate or weakly rursiradiate in the middle part of the flank. At the marginal region the ribs turn forward and terminate at or close to the elongated

ventral tubercles. Frequently two ribs join with each other before they end marginally. This fibulation is a very typical feature for *Reitziites reitzi*. The density of ribbing varies in wide ranges. The venter of smaller growth stages is a narrow flattened ribbon lined by ventral tubercles, which tower only slightly. On specimens with a diameter smaller than 2.5 cm the venter is rounded and the weak, obliquely arranged ventral tubercles reach its midline.

On specimens with diameters exceeding 4 cm marginal tubercles appear and become increasingly prominent as do the ventral tubercles. The space between these two rows of tubercles loses its ornamentation progressively. The ventral tubercles of both sides show alternating to almost opposite positions. However, in no specimens opposite positions were observed over more than a quarter of a whorl. It seems that the ventral tubercles especially of large specimens are hollow. The tubercles are long, pointed spines on the outer side of the shell but shorter and rounded on the internal mould. The marginal nodes may have been hollow too in mature stages.

The umbilical wall is rounded and steep to perpendicular. The suture is ceratitic and shows two lobes on the flank. A small third one is located at the rounded umbilical rim.

The inner whorls of *Reitziites reitzi* have the same ornamentation and whorl section as *Ceratites perauritus* DIENER and *Trachyceras chalnokyi* FRECH. This is observed also on a cast of the inner whorls of the lectotype. Therefore *Ceratites perauritus* and *Trachyceras chalnokyi* are considered to be synonyms of *Reitziites reitzi*.

**Comparison:** The ornamentation of the outer whorls of *Reitziites reitzi* is somewhat similar to some representatives of *Nevadites*. However, the whorl sections differ distinctly, being much broader in *Nevadites*. The inner whorls of *R. reitzi* and of *Nevadites* look quite differently. In contrast to *Nevadites*, *R. reitzi* has normal ribbing without tubercles on the flanks.

## Superfamily **Danubitaceae** SPATH, 1951

### 8.1.3. Family **Danubitidae** SPATH 1951

#### ***Ticinites* RIEBER, 1973**

##### ***Ticinites brescianus* n. sp.**

Pl. 9, Figs. 1–3, 11; Fig. 15m.

#### **Synonymy:**

v 1986 “*Ceratites*” hantkeni MOJS. 1882 – BRACK & RIEBER: Stratigraphy and Ammonoids., p. 203, Pl. 5, Fig. 1.

**Name:** Referring to the Brescian Prealps, the origin of the type series.

**Holotype:** Specimen L/1637 described and figured in Brack & Rieber (1986) as “*Ceratites*” hantkeni. It is the left side of an internal mould with a portion of the body chamber. The suture line is partly visible.

**Stratum typicum and locus typicus:** Lower “Buchenstein Beds,” fossil horizon I at Marcheno in Val Trompia/Prov. Brescia (see Brack & Rieber, 1986, p. 191 and Fig. 10, p. 205).

**Material:** 14 specimens from the lower “Buchenstein Beds” at Marcheno, Biogno, Bagolino and Prezzo. In most cases only the internal moulds of the body chamber are preserved.

**Diagnosis:** Evolute *Ticinites* with subquadrate whorl section, a flat venter with a very faint keel, distinct marginal nodes and small lateral nodes in the inner third of the flank.

**Description:** The whorl section is typically subquadrate (Fig. 15m) with a short steep, but not perpendicular umbilical wall. The venter is nearly flat. Up to a diameter of about 5 cm a very low, faint ventral keel is developed. The ornamentation consists of simple ribs, supplemented by few intercalatories. All ribs bear at the ventral shoulder distinct marginal tubercles. From the latter the ribs draw adorally continue for a short distance and finally disappear. These short, obliquely arranged parts of the ribs accentuate the ventral shoulder which appears to be acute. All ribs which start at the umbilical shoulder bear small, but pointed lateral nodes close to the end of the inner quarter of the flank. The spacing of ribs varies considerably in the available specimens.

The suture line is typically ceratitic with few elements. The denticulation of the lateral lobe is restricted to its basis. The second lobe on the flank shows only two short denticles.

**Comparison:** *Ticinites polymorphus* and *T. ticinensis* from the “Grenzbitumenzone” at M. S. Giorgio show a smaller width of the umbilicus and a different ribbing. In *Ticinites dolomiticus* the ribs are spaced less densely. Brack & Rieber (1986) provisionally assigned the forms named here *Ticinites brescianus* to “*Ceratites*” *hantkeni* MOJS. In the present view of the authors the species *Ceratites hantkeni* does probably not belong to the genus *Ticinites*. According to the figures in Mojsisovics (1882, Pl. 30, Figs. 16 a–c) the umbilical width of *C. hantkeni* is smaller and the whorl considerably narrower than in *T. brescianus*. Unfortunately the type specimen could not be found in the collections of the Geological Institute at Budapest.

**Occurrence:** *T. brescianus* is known from the lower “Buchenstein Beds” of the Brescian Prealps.

**Age:** Lowermost Nevadites Zone.

***Ticinites dolomiticus* n. sp.**

Pl. 9, Figs. 4, 8, 9; Figs. 15n, 17a.

**Name:** Referring to the Dolomites, where the holotype was found.

**Holotype:** Specimen 7092, figured in Pl. 9, Fig. 4. It is the right-hand side of an internal mould of the phragmocone and about 100° of the body chamber. The left side is not preserved.

**Stratum typicum and locus typicus:** “Buchenstein Beds”, lowermost layer of the “Knollenkalke” on the western slope at Seceda east of Ortisei (St. Ulrich, Val Gardena, Italy).

**Material:** Two specimens, 7092 (holotype) and 7093 (paratype).

**Diagnosis:** Evolute representative of *Ticinites* with distantly arranged ribs and a rounded subquadrate whorl section.

**Description:** Because of the incomplete preservation (with the exception of a small part of the phragmocone more than the left half of the shell is missing) the whorl section of the holotype cannot be figured. A reconstructed cross section of the somewhat twisted paratype is illustrated in Fig. 15n. The whorl width is largest in the inner third of the flank. The transition from the short umbilical wall to the flank is rounded and the ventral

**Table 10:**

Dimensions (in mm and %) of the studied *Ticinites* and of the type of *Ceratites hantkeni* (MOJSISOVICS, 1882):

Specimen	D	H	Hr	W	Wr	U	Ur	MN	LN
<i>Ticinites brescianus</i> n. sp., holotype, L/1637	66.0	20.7	31.3	-	-	34.4	52.1	c19	c15
ibid.	36.4	9.5	26.1	-	-	20.0	54.9	c16	c14
L/1641 (Pl.9, Fig.1)	66.2	22.0	33.2	c23.5	35.4	30.2	45.6	16.5	
	10.5								
7090 (Pl. 9, Fig.3)	59.2	17.8	30.0	-	-	29.0	48.9	15	12.5
Type of " <i>C.</i> " <i>hantkeni</i> *	31	10	32.2	35.5	11	14.0	45.2	14	11
<i>Ticinites dolomiticus</i> n. sp., holotype, 7092 (Pl.9, Fig.4)	76.7	24.7	32	-	-	35.0	45.6	16	10
ibid.	60.0	18.9	31.6	-	-	28.8	47.9	17	-
7093 (Pl.9, Figs.8-9)	40.9	13.3	32.6	16.0	39.2	19.3	47.3	15	-
ibid. including ribs	-	-	-	17.4	42.6	-	-	-	-

\* Measurements after MOJSISOVICS (1882).

side is flat and has no keel. In the holotype a low keel may have existed. The ornamentation consists of primaries and of few intercalatories. The primaries start close to the umbilical seam and obtain their largest elevation as more or less bullate tubercles somewhat outside the rounded umbilical shoulder. All ribs end with distinct marginal nodes at the ventrolateral shoulder. The suture line with few elements is typically ceratitic (Fig. 17 a).

**Comparison:** see *Ticinites brescianus*.

**Occurrence and age:** *Ticinites dolomiticus* is known only from the lowermost "Buchenstein Beds" at Seceda. Its age is oldest Nevadites Zone.

**Dimensions:** see *Ticinites brescianus*.

### *Ticinites* sp.

Pl. 9, Fig. 5.

A fragment of a small and moderately evolute ammonoid (7049) is assigned with open nomenclature to *Ticinites*. The whorl is broad-ovate (H/W 0.68 to 0.79 without and with ribs respectively) with a nearly flat ventral side. Strong ribs (single and few branched) start close to the umbilical seam. On the ventral side they terminate abruptly and form small tubercles. In the middle third of the ventral side a broad, smooth zone is developed.

The fragment was found 80 cm above the lower boundary of the "Knollenkalke" on the western slope at Seceda. Its age is Nevadites Zone.

### *Latemarites* n. gen.

**Type species:** *Latemarites latemarensis* n. sp.

**Name:** From the Latemar carbonate platform (western Dolomites, Italy), where the new type species was found.

**Diagnosis:** Evolute ceratitids of medium size with rounded rectangular to subtrapezoidal whorl section and three rows of nodes in a mature stage. The umbilical wall is short and rather steep at the umbilical seam. The umbilical shoulder is rounded. The greatest whorl width is reached close to the end of the inner third of the whorl height. From there towards the "sharply rounded" ventral shoulder the flanks gently converge. The non-car-

inate venter is low-arched to even. The ornamentation changes during ontogeny. In juvenile stages (up to a diameter of about 2.5 cm) it consists of densely to loosely spaced simple, straight or slightly convex ribs which rise near the umbilical seam. They are well elevated in the inner third of the flank and weaken in the middle or outer third. Most of them do not reach the marginal nodes and an almost smooth stripe links the outer termination of the ribs to the marginal nodes. The number of ribs exceeds that of the marginal nodes. Obliquely arranged marginal nodes become distinct at a diameter of 1.5 to 2 cm and tower slightly over the middle of the venter. The rows on both sides are in opposite positions. In subadult to adult stages distinct umbilical and lateral nodes evolve on the ribs. The umbilical nodes are situated at the transition from the umbilical wall to the flank and mark the broadest part of the whorl section. The lateral nodes lie close to the onset of the outer third of the whorl height. There the ribs weaken slightly.

**Suture line:** In ammonoids from Latemar complete suture lines are usually not preserved because of the complete recrystallisation of shells and internal moulds. Nevertheless in few specimens parts of the suture lines could still be observed. They consist of only few elements and are typically ceratitic (Fig. 17b). Of the two lobes on the flanks the outer one is denticulate, whereas the smaller inner one shows no denticles.

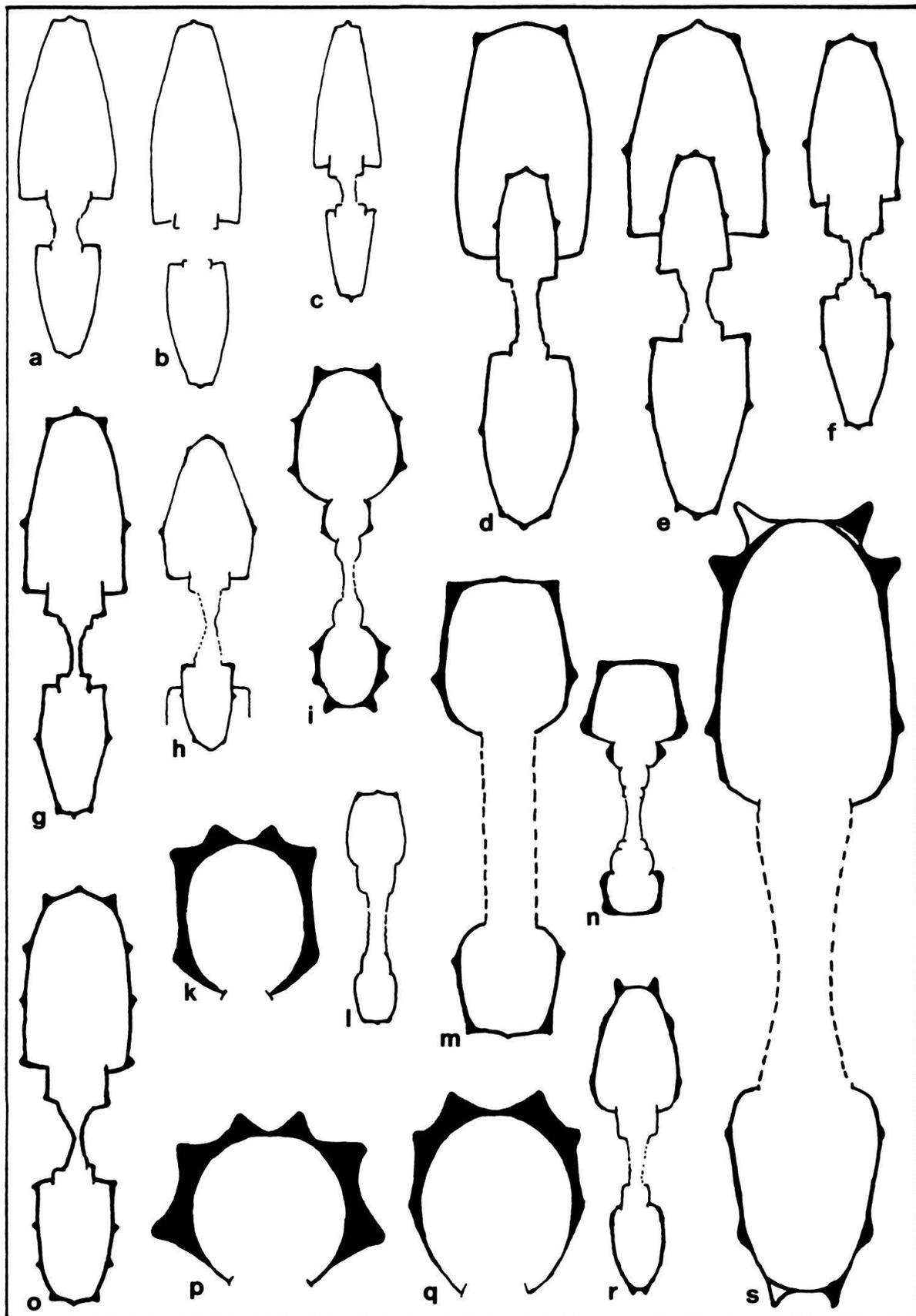
**Remarks:** Because of the small number of elements of the suture lines and the non-carinate venter the new genus *Latemarites* is provisionally assigned to the Danubitidae SPATH, 1951.

**Discussion:** On the basis of its characteristic ornamentation and whorl section in adult stages (three rows of nodes, non-carinate venter, evolute shell) *Latemarites* can be easily distinguished from other Triassic ammonoid genera. Considering the ornamentation *Latemarites* slightly resembles *Kellnerites* (usually with a carinate venter), *Nevadites* (broader whorl section) and *Reitziites* gen. n. (shell moderately involute, juvenile stage with different ribbing, no marginal nodes).

**Composition of the genus:** *Latemarites latemarensis* n. sp.

Fig. 15. Cross and whorl sections of ammonoids dealt with in the text. See legends of plate figures for horizon and locality.

- a *Hungarites zalaensis*, 7009, Pl. 1, Figs. 5–6.
- b *Hungarites zalaensis*, 7007, Pl. 1, Fig. 3.
- c *Hungarites* cf. *plicatus*, 7012, Pl. 2, Fig. 1.
- d *Parakellnerites zoniaensis* n. sp., holotype, 7033, Pl. 3, Fig. 10.
- e *Parakellnerites zoniaensis* n. sp., 7027, Pl. 3, Figs. 1–2.
- f *Parakellnerites zoniaensis* n. sp., 7030, Pl. 3, Fig. 5.
- g *Parakellnerites zoniaensis* n. sp., 7031, Pl. 3, Figs. 6–7.
- h *Parakellnerites rothpletzi*, 7034, Pl. 4, Figs. 1–2.
- i *Latemarites latemarensis* n. sp., holotype, 7069, Pl. 10, Figs. 1–2.
- k *Nevadites secedensis* n. sp., holotype, 7116, Pl. 11, Fig. 8.
- l *Stoppaniceras evolutum* n. sp., holotype, 7095, Pl. 9, Fig. 10.
- m *Ticinities brescianus* n. sp., L/1641, Pl. 9, Figs. 1–2.
- n *Ticinities dolomiticus* n. sp., 7093, Pl. 9, Figs. 8–9.
- o *Kellnerites bagolinensis* n. sp., holotype, 7061, Pl. 6, Figs. 1–2.
- p *Nevadites crassiornatus* n. sp., holotype, 7119, Pl. 12, Figs. 1–2.
- q *Nevadites secedensis* n. sp., 7114, Pl. 11, Figs. 6–7.
- r *Reitziites reitzi*, 7105, Pl. 8, Fig. 5.
- s *Reitziites reitzi*, 7100, Pl. 7, Fig. 5.



**Occurrence:** Known only from Latemar, deeper part of the outcrop at the “Lastei di Valsorda” locality.

**Age:** Reitzi/Kellnerites Zone.

***Latemarites latemarensis* n. sp.**

Pl. 10, Figs. 1–24; Figs. 15i, 17b.

**Holotype:** Specimen 7069, figured in Pl. 10, Figs. 1–2. It is the largest of the available specimens.

**Name:** Referring to the type locality in the Latemar platform (western Dolomites, Italy).

**Locus typicus:** “Lastei di Valsorda” locality in the interior of the Latemar platform. Uppermost portion of the so-called “Lower Platform Facies.”

**Stratum typicum:** Deeper portion of fossiliferous interval of the Latemar Limestone at the above mentioned type locality.

**Material:** The available material consists of more than 40 specimens from just one layer of about 30 cm thickness. The specimens are usually preserved with their shell and show therefore the outer morphology. The shell and their fill are recrystallized and only occasionally the septa are preserved. Moreover the shell cannot be removed from the inner mold in order to uncover the suture lines.

**Diagnosis and description:** In addition to the diagnosis of the genus it should be emphasized, that the strength of the ornamentation and the distances between the ribs vary in wide ranges. This intraspecific variability produced weakly ornamented forms as e.g. 7084 and 7085 (Pl. 10, Figs. 21–24), forms with moderately coarse ribs and nodes as e.g. the holotype and only rarely forms which are coarsely tuberculated (7070, 7071, 7075 (Pl. 10, Figs. 3, 4, 9)). Some specimens of the type series have elevated intercalated ribs. These ribs are restricted to the middle and outer part of the flank and usually do not bear nodes. The largest specimen is the holotype with a diameter of 5.3 cm. It appears to be nearly complete, because nodes and ribs become weaker and the latter are more densely and irregularly spaced on the outer third of the last whorl. On the inner whorls, up to a diameter of about 1.5 cm the ornamentation consists of loosely spaced primaries, which are confined to the inner third of the whorl height and form distinct umbilical bullae. Marginal nodes are absent at this ontogenetic stage.

**Comparison, occurrence and age:** As in *Latemarites* n. gen.

#### 8.1.4. Family **Aplococeratidae** SPATH, 1951

***Aplococeras* HYATT, 1900**

***Aplococeras avisianum* (MOJS., 1882)**

Pl. 12, Figs. 9, 11–12, Fig. 17c.

*Aplococeras avisianum* was found in several layers of the fossiliferous interval at the “Lastei di Valsorda” locality (Latemar) and in layer 4 (i.e. the lower horizon) of the Punta di Zonia section described by Cros & Houel (1983).

In the specimens from Latemar the suture line is not visible (due to the recrystallisation of the internal mould and the shell), but it can be easily observed in some individuals from Punta di Zonia. The suture line of specimen 7125 (Pl. 12, Fig. 12) consists of a

distinctly denticulated lateral lobus and second lobus on the flank where the denticulation just starts (Fig. 17c). In specimen 7124 (Pl. 12, Fig. 11) both lobus are only weakly denticulated.

Asserto (1969) unified *Lecanites vogdesi* HYATT & SMITH from Nevada and *Aplococeras avisianum* from the Alps. Silberling & Nichols (1982, p. 53) separated the forms again (*Aplococeras vogdesi* (HYATT & SMITH), *Aplococeras avisianum* (MOJS.)). Our own observations on the material from the Dolomites support this view. Furthermore, it is possible that *Aplococeras* from Punta di Zonia is not conspecific with those from “Lastei di Valsorda”. In cases where the suture line is not visible *Aplococeras* has no reliable taxonomic characteristics. The ornamentation of *Aplococeras avisianum* from Latemar and Forno (type locality) varies in wide ranges (from coarsely over densely spaced ribs to smooth). Several specimens from Punta di Zonia are larger than those from Latemar and have a slightly different ribbing and cross section. Further research on additional material may show, whether these differences are significant or caused by preservation.

Aplococeratids with no ornamentation and slightly different cross sections were collected from the Marmolada Limestone on the northern slope of Marmolada and at “Isugadoi” on the southern slope of the Latemar platform. These aplococeratids are considered as *Aplococeras misanii* (MOJS.). Several poorly preserved specimens of *Aplococeras* from the “Lower Plattenkalke” at Seceda cannot be specified. A small individual was found together with *Parakellnerites* aff. *rothpletzi* (7046, Pl. 4, Fig. 18).

#### 8.1.5. Family **indet.**

##### ***Nevadites* SMITH, 1914**

**Remarks:** The systematic position of the genus *Nevadites* is still uncertain. Considering the simple suture line the genus resembles *Ticinites*. It is therefore provisionally assigned to the Family Danubitidae. Further comparative studies on the suture line among other features may reveal whether this is justified.

From the lower “Buchenstein Beds” of the Brescian Prealps Brack & Rieber (1986) mentioned *Nevadites* and also regarded as such two species (*N. dealessandri* and *N. ambrosionii*) from the “Grenzbitumenzone” at Monte San Giorgio, which formerly had been referred to as *Protrachyceras* (Rieber, 1973a). These *Nevadites* were joined in the group of *Nevadites reitzi* (BÖCKH, 1872). However, our new fossil finds from Bagolino clearly demonstrate that the species *reitzi* cannot be linked to *Nevadites*.

When compared with the forms from Nevada all representatives of *Nevadites* from the Southern Alps show a different umbilical region. In juvenile and adult individuals from the Alps the transition from the flank to the umbilical wall is rounded and no umbilical edge is developed. The umbilical wall itself can be steep close to the umbilical seam, but in no case is it perpendicular or even overhanging as in juvenile specimens from Nevada. The ribbing and the widely varying tuberculation are also different. Nevertheless, the representatives from the Southern Alps are considered as *Nevadites*. Further finds and studies may show, if a new genus for these southalpine *Nevadites* would be more appropriate.

The inner whorls of *Nevadites* and, in particular, those of the “Grenzbitumenzone” have ornamentations similar to *Protrachyceras* as stated by Rieber (1973a, p. 65). It seems thus probable that *Nevadites* is a forerunner of the Trachyceratids.

***Nevadites avenonensis* n. sp.**

Pl. 11, Figs. 9–12, Pl. 12, Figs. 5–6.

**Synonymy:**? 1913–14 *Trachyceras reitzi*. – HORN.v 1986 Group of *Nevadites reitzi*. – BRACK & RIEBER, Pl. 2, Fig. 2, Pl. 4, Fig. 4.

**Holotype:** Specimen 7117, figured on Pl. 11, Figs. 11–12. It consists of the anterior part of a body chamber. The right flank and the venter are preserved.

**Name:** Referring to Avenone (Comune Pèrtica Bassa, Prov. Brescia, Italy), a small village two kilometers northwest of which the holotype was found.

**Stratum typicum and locus typicus:** Grey, cherty limestones of the lower “Buchenstein Beds” at Pèrtica (coord. 604900/5069100). The specimen was collected 1 m below the “Chiesense groove” (see Brack & Rieber 1986).

**Material:** Five specimens form the type locality and one from Biogno.

**Diagnosis:** *Nevadites* with rounded rectangular whorl section, irregular, weakly prosirate ribbing and three rows of tubercles (weak umbilical, distinct lateral and strong ventral ones). The lateral tubercles vary in size and are located at some distance above the midline of the flanks. The venter is rather flat, broad and weakly undulated in the direction of the spiral.

**Description:** In large specimens, as e.g. the holotype, the umbilical tubercles are only weak or even absent. In smaller specimens they are located outside the rounded umbilical rim. Their tips point away from the flanks. The umbilical wall is smooth and steep, but not perpendicular or even overhanging. The flanks bear simple ribs, which start with umbilical tubercles. Other specimens have intercalatories with no such tubercles. The holotype shows a primary rib which splits in two secondaries at the lateral tubercles. All ribs bear rather strong ventral tubercles of the same size, whereas some intercalatories have no lateral tubercles. The ventral tubercles extend only slightly beyond the flattened stripe of the venter, and the rows on both sides show alternating as well as opposite positions. In specimen (L 1632) from Biogno (Brack & Rieber 1986, Pl. 4, Fig. 4) small tubercles appear between the lateral and ventral ones. This specimen has therefore a similar ornamentation as *N. ambrosionii* (Airaghi) and *N. dealessandri* (Airaghi) from the “Grenzbitumenzone” at Monte San Giorgio, Ticino/Switzerland (Rieber 1973a). The incomplete preservation of the available specimens impedes measurements of the whorl section and umbilical width. No suture line was observed.

Fig. 16. Suture lines of ammonoids. See legends of plate figures for horizon and locality; H: height of the whorl wherefrom the suture line was taken.

a *Hungarites* cf. *plicatus*, H = 30 mm, 7013, Pl. 2, Fig. 2.

b *Hungarites* cf. *plicatus*, H = 14 mm, 7012, Pl. 2, Fig. 1.

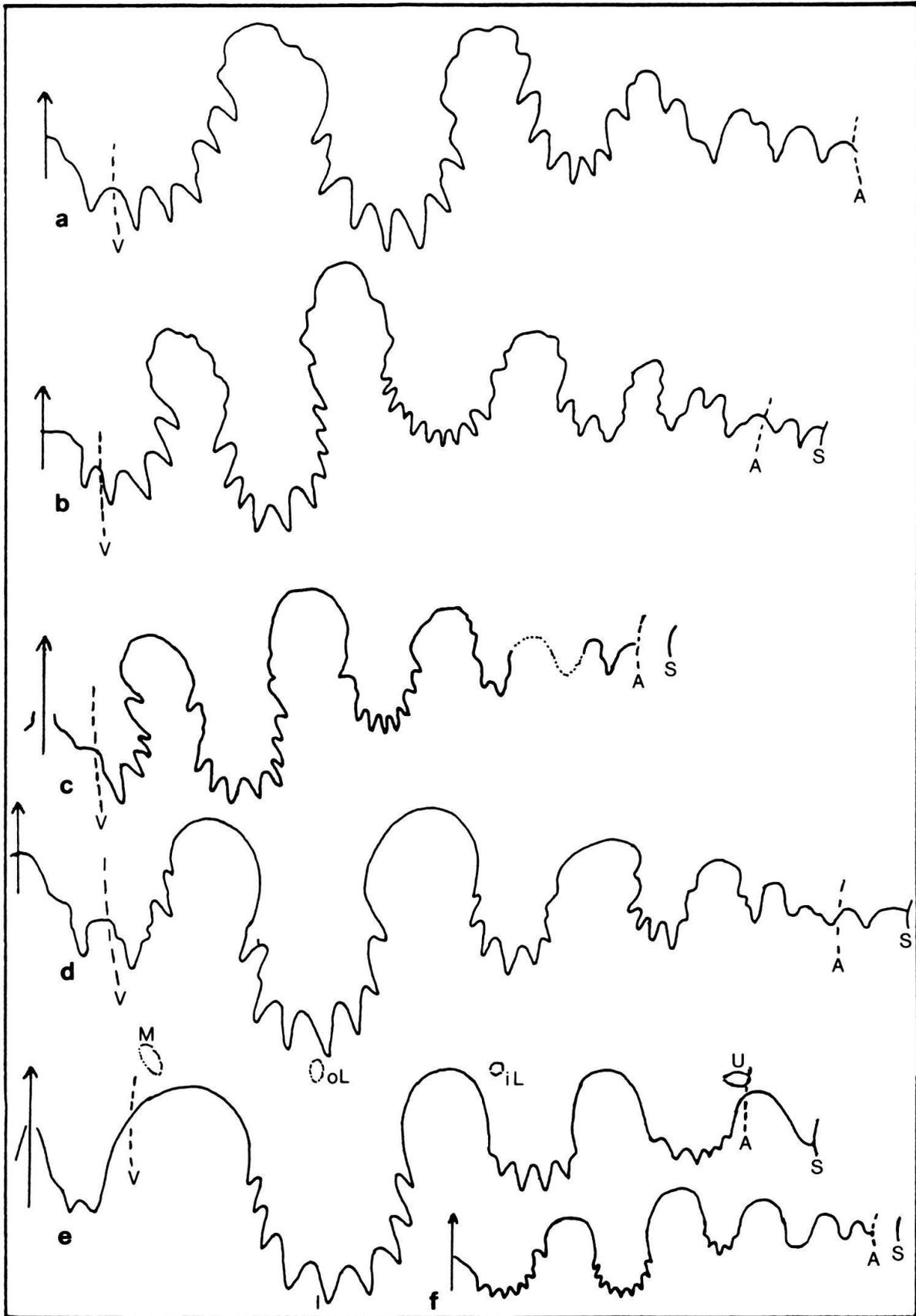
c *Hungarites* cf. *plicatus*, H = 16 mm, 7013, horizon and locality as in b.

d *Parakellnerites zoniaensis* n. sp., H = 25 mm, 7027, Pl. 3, Figs. 1–2.

e *Kellnerites bagolinensis* n. sp., H = 18 mm, holotype, 7061, the position of the nodes is indicated, Pl. 6, Figs. 1–2.

f *Parakellnerites arthaberi*, H = 20 mm, 7025, Pl. 12, Fig. 7.

A: umbilical angle or edge (dashed line), oL: outer lateral node, iL: inner lateral node, M: marginal nodes, S: umbilical seam, U: umbilical node, V: ventral shoulder (dashed line).



**Discussion:** Especially in small specimens of *Nevadites hyatti* (Smith) and *N. humboldtensis* Smith the umbilical wall is overhanging. The tips of the strong umbilical tubercles point towards the center of the umbilicus and the lateral tubercles are located near the midline of the flanks. Furthermore, the ribbing is more regular, and the intercalatories are shorter than in *N. avenonensis* n. sp. *Nevadites ambrosionii* and *N. dealessandri* have a fourth row of small tubercles between the lateral and the ventral tubercles. *Nevadites dealessandri* has usually thinner and higher whorls than the new species.

**Occurrence:** *N. avenonensis* n. sp. was found in the lower "Buchenstein Beds" at the locus typicus and its surroundings as well as at Biogno (see Brack & Rieber 1986, p. 191).

**Age:** Nevadites Zone.

***Nevadites secedensis* n. sp.**

Pl. 11, Figs. 4–8, Pl. 12, Figs. 3–4, 8; Figs. 15k, 15q, 17d.

**Synonymy:**

- ? 1879 *Trachyceras Reitzi* БÖCKH–МОJСИСОВIС: Die Dolomitriffe von Südtirol und Venetien, S. 53.  
 ? 1879 *Trachyceras* cf. *Reitzi* БÖCKH–МОJСИСОВIС: ibid. S. 150.  
 ? 1882 p.p. *Trachyceras reitzi* (БÖCKH, 1873). – МОJСИСОВIС: Die Cephalopoden der mediterranen Triasprovinz, p. 114 (findings from "Pufelser Schlucht bei St. Ulrich in Gröden").

**Remarks:** Although no completely preserved specimen of this form was found and all available fragments differ in preservation, size, ornamentation and cross section, it is appropriate to establish at least one new species for this group.

**Holotype:** Specimen 7116 (Pl. 11, Fig. 8), an internal mould of the phragmocone and the body chambers. It is slightly twisted and corroded.

**Name:** Referring to the Seceda peak, a mountain 5 km northeast of Ortisei (St. Ulrich, Val Gardena, Italy), where the holotype and several other specimens were found.

**Locus typicus:** Western slope of the Seceda peak.

**Stratum typicum:** Lower "Buchenstein Beds," several layers around 3 m above the base of the "Knollenkalke".

**Material:** 17 specimens from the locus typicus, 14 of which are only small fragments of the body chamber. Five poorly preserved specimens come from several localities in the Brescian Prealps. All specimens are somewhat bent and corroded.

**Diagnosis:** Evolute *Nevadites* with strong lateral and ventral spines. Umbilical tubercles vary in size and are absent on the body chambers of several specimens. Whorl sections at the interspaces are subcircular with the height exceeding slightly the width. The umbilical wall is smooth, rounded, and steep. The ventral side is narrow and V-shaped. Ventral spines are in opposite positions. The ribbing is variable, with or without intercalatories. All ribs end at ventral nodes. The ceratitic suture consists of few elements.

**Description:** The holotype shows a largest diameter of 6.5 cm. The last half turn is a part of the body chamber and the diameter at the end of the phragmocone measures 41 cm. Specimen 7122 (Pl. 12, Fig. 8) has a phragmocone diameter of 5.8 cm. The diameter of the restored shell of the fragment 7114 (Pl. 11, Figs. 6–7) is 11.5 cm. The shape of another, small fragment 7162 (not figured) suggests that diameters of large individuals may have reached up to at least 15 cm. The lateral ornamentation of the holotype consists of strong simple ribs with wide interspaces. The ribs bear pronounced and radially somewhat elongated umbilical tubercles as well as strong pointed lateral and

ventral nodes of similar size. On the inner whorls the ribbing is denser and intercalatories are developed. All ventral nodes have the same size. The lateral nodes on the intercalatories are slightly weaker than those of the primaries. The slope between the flank and the umbilical seam is rounded (i.e. between the umbilical tubercles). The umbilical wall is steep, but not perpendicular. The marginal region is also curved at the interspaces. Specimen 7114 (Pl. 11, Figs. 6–7) is a fragment of the body chamber (about 60°) and a small part of the phragmocone and shows no umbilical tubercles. The ornamentation of the flanks consists of simple, prosiradiate ribs. The latter become increasingly stronger (higher) towards the outer part. Both, lateral and ventral nodes are strong. The ventral nodes are slightly larger than the lateral ones. The umbilical wall is smooth and rounded. Ribbing and tuberculation of this species thus vary in wide ranges.

**Comparison:** The shell of *N. secedensis* is more evolute than shells of all other alpine *Nevadites* (*N. crassiornatus* excluded). The positions of ventral nodes are opposite. Small tubercles between lateral and ventral nodes as observed in *N. ambrosionii* do not occur in *N. secedensis*.

**Occurrence:** In addition to the 17 specimens from the locus typicus several poorly preserved specimens were found in the lower “Buchenstein Beds” of the Brescian Prealps (Marcheno, Biogno, Pèrtica, Bagolino).

**Age:** Nevadites Zone.

***Nevadites crassiornatus* n. sp.**

Pl. 12, Figs. 1–2; Fig. 15p.

**Remarks:** A new species is established for a single specimen from the locus typicus and stratum typicum of *Nevadites secedensis* n. sp. which differs significantly from all other specimens of *Nevadites*.

**Holotype:** Specimen 7119 (Pl. 12, Figs. 1–2), the internal mould of the left side and venter of a body chamber.

**Name:** Referring to the coarse ribbing and tuberculation of the species.

**Locus typicus:** Western slope of the Seceda peak near Ortisei (St. Ulrich, Val Gardena, Italy).

**Stratum typicum:** Lower “Buchenstein Beds,” upper surface of the T<sub>e</sub>-tuff level, 3 m above the lower boundary of the “Knollenkalke.”

**Material:** One single specimen (the holotype).

**Diagnosis:** Evolute *Nevadites* with strong and pointed umbilical, lateral and ventral tubercles on the body chamber. The cross section of the whorl is subcircular at the wide interspaces. The number of ventral spines exceeds the one of lateral spines by a factor of two. The additional ventral spines are located in the interspaces but closer to the anterior spines than to the posterior ones. The ventral side between the ventral spines is narrow and broadly V-shaped.

**Description:** Most remarkable features of this species are strong umbilical tubercles on the anterior part of the body chamber as well as additional ventral spines. It seems as if the additional ventral spines belong to intercalatories, which are not developed on the body chamber. The ventral spines on both sides occupy opposite positions.

**Comparison:** *Nevadites crassiornatus* differs from all other known species of *Nevadites* by its coarse tuberculation and ribbing with wide interspaces.

**Occurrence and age:** Known only from the locus typicus. Nevadites Zone.

Superfamily **Trachycerataceae** HAUG, 1894

8.1.6. Family **Arpaditidae** HYATT, 1900

**Protrachyceratinae** TOZER, 1971

Pl. 13; Figs. 17 g, 17 h.

Several protrachyceratinids were found in situ in the “Knollenkalke” of the “Buchenstein Beds” in the Brescian Prealps/Giudicarie, Val Gola and in the Dolomites. Specimens of *Eoprotrachyceras curionii* (MOJS.) and *Eoprotrachyceras recubariense* MOJS. are illustrated in Brack & Rieber (1986, Pl. 5, Figs. 4–5).

**(Eo-)Protrachyceras margaritosum** (MOJS., 1882)

Pl. 13, Figs. 6–7; Fig. 17 h.

Two trachyceratids are comparable with *Eoprotrachyceras margaritosum* (MOJS.). The specimen (7129, Pl. 13, Fig. 6) from the “Knollenkalke” at Bagolino is an internal mould of a part of the body chamber. It has nine rows of tubercles and a deep external sulcus. The strong clavate tubercles bordering the sulcus are arranged in an altering fashion.

A second specimen (7130, Pl. 13, Fig. 7), from the scree of the “Knollenkalke” at Val Gola consists of the body chamber and a part of the phragmocone with a suture line. The ornamentation has eight rows of distinct tubercles. A ninth spiral of very weak tubercles occupies the interspace between the umbilical and the first row of distinct lateral tubercles. The spirally elongated tubercles bordering the narrow and shallow median sulcus are in alternating positions. The suture line (Fig. 17 h) shows denticulated saddles. However, this denticulation is less deep compared to the lobes. Furthermore, the denticulation of the saddles and flanks looks similarly irregular as do suture lines in other trachyceratids. The denticulated saddles suggest an affiliation of the species *margaritosum* to the genus *Protrachyceras* instead of *Eoprotrachyceras* as supposed by Tozer (1980, p. 107).

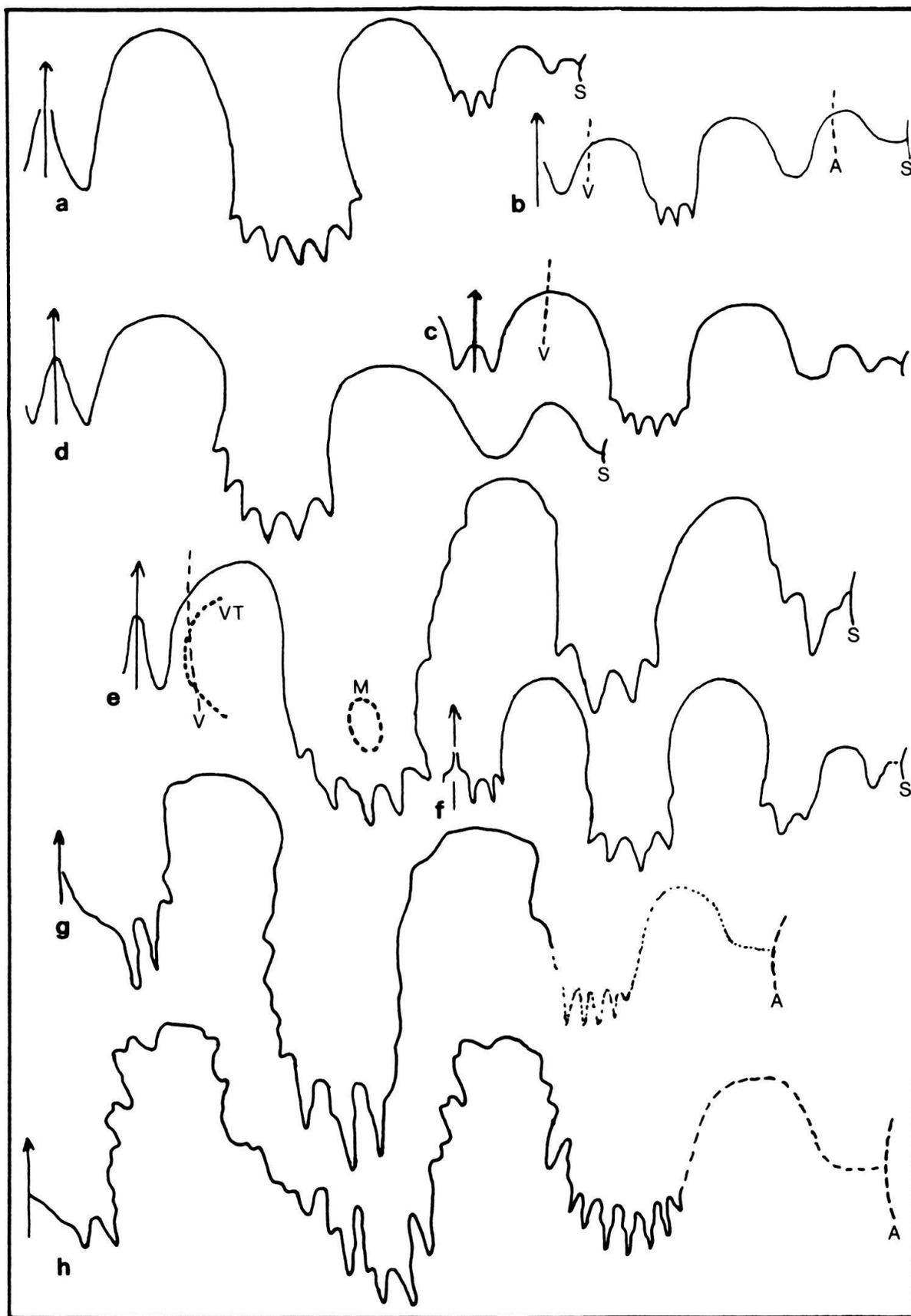
**Protrachyceras steinmanni** (MOJS., 1882)

Pl. 13, Figs. 1, 4–5; Fig. 17 g.

Two specimens (7126, 7128) from the same layer in the upper “Knollenkalke” at M. Corona and a fragment (7127) from a somewhat older layer at Bagolino are assigned to

Fig. 17. Suture lines of ammonoids. See legends of plate figures for horizon and locality; H: height of the whorl wherefrom the suture line was taken.

- a *Ticinites dolomiticus* n. sp., H = 15 mm, holotype, 7092, Pl. 9, Fig. 4.
  - b *Latemarites latemarensis* n. sp., H = 9 mm, 7089, Latemar Limestone, “Lastei di Valsorda” locality.
  - c *Aplococeras avisianum*, H = 7 mm, 7125, Pl. 12, Fig. 12.
  - d *Nevadites secedensis* n. sp., H = 18 mm, 7122, Pl. 12, Fig. 8.
  - e *Reitziites reitzi*, H = 33 mm, 7100, the position of the marginal and ventral tubercles is indicated, Pl. 7, Fig. 5.
  - f *Reitziites reitzi*, H = 11 mm, 7111, Pl. 8, Fig. 12.
  - g *Protrachyceras steinmanni*, H = 23 mm, 7127, Pl. 13, Fig. 5.
  - h *(Eo-)Protrachyceras margaritosum*, H = 25 mm, 7130, Pl. 13, Fig. 7.
- A: umbilical angle or edge (dashed line), M: marginal node, S: umbilical seam, V: ventral shoulder (dashed line), VT: ventral tubercles (dotted line).



*Protrachyceras steinmanni* (MOJS.). The ornamentation and cross sections correspond to the figures and description of the type of this species in Mojsisovics (1882, Pl. 81, Figs. 8–10, p. 109).

Specimen 7127 from Bagolino shows parts of the suture lines (Fig. 17 g). The lateral lobus has long lobules, whereas the saddles are nearly smooth. Only weak deflections are developed on the flanks of the saddles. Therefore the species *steinmanni* might indeed be joined with the genus *Eoprotrachyceras* (Tozer 1980).

A large *Daonella pichleri* is preserved on the back side of the slab with specimen 7126.

### ***Protrachyceras gortanii* PISA, 1966**

Pl. 13, Figs. 8–9.

A specimen (7132) from the “Knollenkalke” on the northern slope at Seceda is considered as *Protrachyceras gortanii* Pisa morphotype *nodato*. It is the internal mould of the body chamber. The phragmocone is not present. The ornamentation consists of single, branched and intercalatory ribs with five rows of weak, radially elongated tubercles. In the center of the rounded external side the ribs are completely interrupted and a sharply bordered, shallow median sulcus is developed.

### ***Protrachyceras archelaus* (LAUBE, 1868)**

Pl. 13, Figs. 2–3.

A well preserved specimen (7133, Pl. 13, Figs. 2–3) of *Protrachyceras archelaus* (LAUBE) comes from the lowermost “Wengen Beds” at M. Corona only a few meters above the top of the “Buchenstein Beds.” The small individual (diameter 2.8 cm) shows the typical ornamentation (six rows of tubercles and a distinct median sulcus) and cross section of *Protrachyceras archelaus*.

### **Remarks on the classification and ecology of ammonoids discussed in this chapter:**

The systematic positions of middle/late Anisian to early Ladinian ammonoid genera from the Alps are based mainly on distinctive characteristics of the ornamentation and the cross section. The systematic positions of genera such as *Nevadites*, *Ticinites* and the new *Reitziites* and *Latemarites* are problematic. They cannot be affiliated to a family on the basis of their ornamentation and cross section alone. It seems, however, that the suture line although not always visible and usually not considered as an important taxonomic characteristic might provide useful addition information.

The number and shapes of lobes as well as the position of the umbilical angle and seam are compared in the following table. In order to facilitate the comparison the lateral and subsequent umbilical lobes are numbered consecutively.

Two groups may be distinguished in Table 11. Ammonoids of a first group with dominance of ceratitids have broad, denticulated external lobes and at least four additional lobes up to the umbilical angle. A second group including Danubitidae and Protrachyceratinae is characterized by a narrow external lobe and only two lobes (L and U2) up to the umbilical angle. *Kellnerites* and *Lardaroceras* have broad to moderately narrow external lobes and four lobes up to the umbilical angle and therefore occupy an intermediate position. Further studies are needed to clarify if these observations are of decisive importance for the taxonomy of these ammonoids.

**Table 11:**  
Shapes of the suture lines and position of the umbilical angle (A) and umbilical seam (S) in selected ammonoids of this study.

Lobes on the flank Development, number	E		L	U <sub>2</sub>	U	U	U	U	U	
	Ebd	En	1	2	3	4	5	6	7	
<b>Genus or species</b>										
<i>Hungarites cf. plicatus</i>	+	-	+	+	+	+	+	A	+	S
<i>Parakellnerites zoniaensis</i>	+	-	+	+	+	+	+	+	A	S
<i>Parakellnerites arthaberii</i>	+	-	+	+	+	A	-S	-	-	-
<i>Lardaroceras</i>	+	-	+	+	A	±	-	-	-	-
<i>Kellnerites bagolinensis</i>	-	+	+	+	A	S	-	-	-	-
<i>Ticinites dolomiticus</i>	-	+	+	A	S	-	-	-	-	-
<i>Latemarites latemarensis</i>	-	+	+	A	S	-	-	-	-	-
<i>Aplococeras avisianus</i>	-	+	+	A	S	-	-	-	-	-
<i>Nevadites secodensis</i>	-	+	+	A	S	-	-	-	-	-
<i>Reitziites reitzi</i>	-	+	+	A	S	-	-	-	-	-
<i>Protrachyceras steinmanni</i>	-	+	+	A	±	-	-	-	-	-

A: umbilical angle (umbilical edge), E: external lobe, Ebd: external lobe broad and denticulated, En: external lobe narrow not or weakly denticulated, L: lateral lobe, U: umbilical lobe; the lateral lobe and the following umbilical lobes are numbered consecutively.

Ammonoid faunas from platform interior portions and platform slopes (Latemar and Marmolada Limestones respectively) obviously differ from those in coeval basinal settings ("Buchenstein Beds" and "transitional beds"). The faunas from Latemar and Marmolada are characterized by the frequent occurrence of *Hungarites*, *Parakellnerites* and *Aplococeras*. In basinal equivalents *Kellnerites*, *Reitziites* and *Chieseiceras* are locally dominant but *Nevadites* and *Ticinites* also occur. In the "Lower Plattenkalke" ammonoids are rare. This may be partly due to diagenetic processes but other fossils such as *Daonellas* are locally abundant.

The fauna of the "Grenzbitumenzone" at M. S. Giorgio (Rieber 1973 a, b) occupies an intermediate position. However, if the fauna is considered on a layer by layer basis the composition varies remarkably strong from bed to bed. Surprisingly no *Hungarites* were found so far in this succession.

It seems as if *Hungarites*, *Parakellnerites* and *Aplococeras* lived preferentially in shallow waters in close vicinity of carbonate platforms whereas other ammonoid genera and species preferred deeper and/or open sea waters.

## 8.2. Class **Bivalvia**

### Order **Pterioida** NEWELL, 1965

#### 8.2.1. Family **Posidoniidae** FRECH, 1909

#### ***Daonella* MOJSISOVICS, 1874**

*Daonellas* are an important component of the faunas in the "Buchenstein Beds" of the Dolomites and in the "Grenzbitumenzone" at M. S. Giorgio (Rieber, 1969). In particular the group of *Daonella elongata* MOJS. are reliable guide fossils. Other species of *Daonella* proved also to be useful for stratigraphic correlations.

***Daonella (Longidaonella)* FARSAN, 1972**

Pl. 14, Figs. 4, 7, 10.

Several horizons in the uppermost “Lower Plattenkalke” at Seceda and Pufels yielded abundant and in several cases extraordinarily well preserved specimens of the group of *Daonella (Longidaonella) elongata*. Specimens of the three species *D. (L.) elongata* MOJS., *D. (L.) angulata* RIEBER, and *D. (L.) serpiensis* RIEBER are illustrated on Plate 14.

***Daonella cerneraensis* n. sp.**

Pl. 14, Figs. 8–9, 11–19.

**Holotype:** Specimen 7142 figured on Pl. 14, Figs. 11 and 13.**Name:** Referring to the Cernera mountain in the central Dolomites just south of the type locality.**Locus typicus:** Small hill southwest of Punta di Zonia on the northern slope of the Cernera platform.**Stratum typicum:** Layer 4 of the section described by Cros & Houel (1983, p. 441, Fig. 7 B) as “coquina – phosphatized biosparite with ammonites of the avisianus zone”. The writers assign this level to the Reitzi/Kellnerites Zone.**Material:** Single valves on several slabs from the type locality and from the “Lower Plattenkalke” at Seceda.**Diagnosis:** Small *Daonella* with elongate, oblique shape. Elevated beak somewhat anterior and greatest height considerably posterior to the middle of the valve. Ribs in the middle part of the valve are rather broad with narrow grooves in between. Towards the posterior and anterior dorsal margin the spacing of the ribs becomes abruptly narrower and the grooves wider. The ribs disappear in the narrow, vaulted sectors at the dorsal margin. Only few ribs in the middle of the posterior part of the valve have narrow second-order grooves.**Table 12:**Dimensions of *Daonellas* in mm (method of measurement after SILBERLING & NICHOLS, 1982, p. 67)

Specimen	L	H	HL	AD	AV	AV/L
<i>D. cerneraensis</i> (holotype, 7142 ; Pl.14, Fig.11)	19	8.8	0.46	8.3	14	0.72
<i>D. sotschiadensis</i> (holotype, 7138 ; Pl.14, Fig.5-6)	21.5	13.6	0.63	9.2	13.5	0.62

L, length; H, height; AD, anterior dorsal length; AV, anterior ventral length.

**Description:** The ribbing of *Daonella cerneraensis* n. sp. varies from specimen to specimen. However, in the middle part of the valve the ribs are generally broad, flat-topped, and separated by narrow grooves. At the onset of the posterior part (a sector of about 40°) the grooves become considerably wider and in the last 20–10° of the posterior valve portion the ribs and grooves fade and finally disappear near (10–5°) the vaulted dorsal margin. On the anterior portion of the valve the variation of the ribbing is generally less pronounced. The smooth sector along the dorsal margin is also narrower. The strong beak is prosogyral and towers slightly across the dorsal margin. An elevation of the shell starts at the beak and takes its course to the ventral margin reaching (about 20°) behind

the middle of the valve. The largest specimen (7145, Pl. 14, Figs. 16, 19) from Seceda has a length of 3.5 cm.

**Discussion:** *Daonella cerneraensis* resembles *Daonella serpianensis*. However, the latter has a weaker and less elevated beak. The ribbing, especially near the beak, is also weaker in *D. serpianensis*.

Very similar to *D. cerneraensis* with respect to the size, the outline of the valve, the development of the beak and the arrangement of the ribs are *Daonellas* from grey siltstone and marls at M. Rite. However, the ribbing of the latter seems to be generally finer than in *D. cerneraensis*. The *Daonellas* from M. Rite are compressed and preserved in a different way which hampers a detailed comparison. Studies on additional material from M. Rite may reveal whether these *Daonellas* have to be considered as *D. cerneraensis*. In any case they cannot be assigned to *D. fascicostata* RIEBER, as suggested by Farabegoli (1979, p. 52). *Daonella pauciforata* RIEBER as mentioned in Assereto (1971) is presumably a misprint.

**Occurrence and age:** Known from the type locality and the "Lower Plattenkalke" at Seceda. Very similar forms are known from M. Rite. Reitzi/Kellnerites Zone.

***Daonella sotschiadensis* n. sp.**

Pl. 14, Figs. 5–6.

**Holotype:** Specimen 7138, figured on Pl. 14, Figs. 5–6.

**Name:** Referring to Sotschiada, an old name for the Seceda mountain where the holotype and the paratypes were found.

**Locus typicus:** Western slope of Seceda, 5 km NE of Ortisei (St. Ulrich, Val Gardena, Italy).

**Stratum typicum:** "Buchenstein Beds", "Lower Plattenkalke", about 2.3 m below the base of the "Knollenkalke".

**Material:** The holotype and five fragments of single valves.

**Diagnosis:** Relatively small *Daonellas* with ovate shape, elevated beak slightly anterior to the middle of the valve. Ribs start near the beak and are broad and flat-topped, grooves are narrow. Some ribs have fine second-order grooves.

**Description:** *Daonella sotschiadensis* is characterized by its broad, top-flattened ribs. These are separated by narrow, rather deep first-order grooves starting at a distance of 0.25 to 0.3 cm from the elevated beak. Second-order grooves appear 0.7–1 cm from the beak and can be traced up to the margin of the valve. Comarginal folds are especially prominent near the beak.

**Discussion:** *Daonella sturi* BENECKE shows some similarity with *Daonella sotschiadensis* but has narrower and irregularly arranged ribs, broader first-order grooves and reaches larger sizes (length exceeding 8 cm). *Daonella paucicostata* TORNQUIST has narrower ribs and broader grooves. The valve is higher than in *D. sotschiadensis*. The second-order grooves of the relatively large *Daonella dubia* (GABB) from the Humboldt Range in Nevada (Silberling & Nichols 1982, p. 68) become broader and deeper than in *D. sotschiadensis*. The paucicostate *Daonellas* from the higher stratigraphic intervals of the Latemar and Marmolada Limestone have broader, top-rounded ribs.

**Occurrence and age:** Known from the "Lower Plattenkalke" at Seceda. Reitzi/Kellnerites Zone.

***Daonella pichleri* MOJS., 1874**

Pl. 14, Figs. 1–3.

In several levels of the “Upper Bänderkalke” at Seceda and of the upper “Knollenkalke” at M. Corona often well preserved specimens of *Daonella pichleri* MOJS. occur frequently. At M. Corona this species was found together with *Protrachyceras steinmanni* MOJS.

Most characteristic features of *D. pichleri* are the position of the beak in the anterior third of the valve, the straight dorsal margin and the ontogenetical growth of the height of the shell. This can be best demonstrated by the dimensions in the following table.

**Table 13:**

Dimensions (in mm) of specimens of *Daonella pichleri* (method of measurement after SILBERLING & NICHOLS, 1982, p. 67):

Specimen	L	H	H/L	Ad	AV	AV/L	AD/L
7136 (M. Corona, Pl.14, Fig.3)	17.5	10.5	0.6	5.4	7.8	0.4	0.31
ibid.	25.6	15.9	0.61	7.6	11.2	0.43	0.29
ibid.	35.8	23.3	0.65	11.6	16.6	0.46	0.32
ibid.	c50.1	31.9	0.63	16.5	22.8	0.45	0.33
7126 (M. Corona)	24.4	16.6	0.68	5.8	12.7	0.52	0.23
ibid.	42.1	32.9	0.78	10.7	23.2	0.55	0.25
7134 (Seceda; Pl.14, Fig.1)	16.1	10.6	0.66	4.2	9.3	0.58	0.26
ibid.	28.1	20.2	0.72	8.1	14.4	0.51	0.29
7135 (Seceda; Pl.14, Fig.2)	21.7	13.6	0.63	5.4	13.4	0.62	0.25
ibid.	30.8	19.4	0.63	9.6	19.2	0.62	0.31

L, length; H, height; AD, anterior dorsal length; AV, anterior ventral length.

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