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MIDDLE TRIASSIC CERATITIDS (AMMONOIDEA) COLLECTED BY C. RENZ FROM HYDRA (GREECE)

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Riassunto. Per la prima volta vengono descritti e illustrati alcuni ceratitidi raccolti più di 50 anni fa da C. Renz nel Calcare di Han-Bulog dell' isola di Hydra (Grecia). Le forme identificate sono: *Asseretoceras camunum* (Assereto, 1963), *Megaceratites* aff. *fallax* Balini, 1992b, *Ronconites* sp. n. A, *"Kellnerites"* sp. ind., *Nevadites* sp. ind. Vengono inoltre descritti due ceratitidi in nomenclatura aperta. L' importanza di queste identificazioni è sostanzialmente paleoecologica, poichè il materiale non fu raccolto strato per strato. *A. camunum* ed i generi *Megaceratites* e *Ronconites* sono segnalati per la prima volta nel Calcare di Han-Bulog. *Megaceratites* e *Ronconites* sono inoltre segnalati per la prima volta al di fuori delle Alpi meridionali.

Abstract. This paper is focused on the description of an assemblage of ceratitids collected more than 50 years ago by C. Renz from the Han-Bulog Limestone of Hydra (Greece), up to the present never described. The identified forms are *Asseretoceras camunum* (Assereto, 1963), *Megaceratites* aff. *fallax* Balini, 1992b, *Ronconites* sp. n. A, *"Kellnerites"* sp. ind., *Nevadites* sp. ind. Two ceratitids of uncertain attribution are also described. These species have only paleoecological implications, since a stratigraphic bed-by-bed sampling has not been performed. *A. camunum* and the genera *Megaceratites* and *Ronconites* are reported for the first time from the Han-Bulog Limestone. *Megaceratites* and *Ronconites* are also reported for the first time out of the Southern Alps.

Introduction.

Carl Renz (1876-1951) was a pioneer in the Triassic stratigraphy of Greece. He discovered and sampled several ammonoid-bearing localities in the Peloponnesus (i.e., Epidauros and Aghios Andreas) and in the islands of the Egean Sea (i.e., Hydra and Chios) (Frech, 1907; Frech & Renz, 1908; Renz, 1910; Renz & Renz, 1948). However, the well preserved material from Hydra was never fully studied. In this paper the most interesting and unpublished specimens are described and figured.

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History and analysis of the collection.

Renz's first visit to Hydra dates back to 1907 (Renz, 1907), when he discovered an ammonoid fauna in the Upper Anisian/Lower Ladinian Han-Bulog Limestone. Few years later this initial small collection was described together with material from the Argolis Peninsula (Frech & Renz, 1908; Renz, 1910). As a result of additional research the collection increased (Renz, 1913), and in 1931 a list of 117 species and varieties was finally published (Renz, 1931). After Renz's death this collection was deposited in Basel, at the Museum of Natural History.

The unpublished collection from Hydra is made of several tens of well-preserved specimens. Each specimen is accompanied by a label reporting the formation and locality of collection. All the specimens were collected from very few localities comprised of the Han-Bulog Limestone (Fig. 1): Aghia Irene (mainly), Aghia Triada and the bay of Tsingri ("Tsingri Bucht") (1).

The collection is composed of ammonoids typical of the Anisian (Middle Triassic) red nodular limestone, such as the Tethyan Han-Bulog and Schreyer Alm Limestones. Most of the specimens belong to the families Ptychitidae (genera *Ptychites*, *Flexoptychites* and *Malletoptychites*), Arcestidae, Sturiidae (genera *Sturia* and *Discoptychites*) and Gymnitidae. *Monophyllites* and Cladiscitidae are also present. The family Ceratitidae represents less than 10% of the collection. Among the Ceratitidae *Asseretoceras camunum* (Assereto, 1963), *Megaceratites* aff. *fallax* Balini, 1992b, *Ronconites* sp. n. A, *"Kellnerites"* sp. ind. and *Nevadites* sp. ind. have been recognized. All the identified genera are stratigraphically significant. Two specimens have been described as *"Ceratites"* aff. *falcifer* Hauer, 1896 and *Ceratitidae* gen. ind. sp. ind. Their generic position, at present open, will be reviewed in a future paper.

Significance of the ceratitids.

Renz's ammonoids were not sampled stratigraphically in well described sections. Thus, a direct correlation of the Han-Bulog Limestone to ammonoid zones is hardly possible. However, taking into account the stratigraphic distribution of the genera recently collected in the Southern Alps (Balini, 1992a; Balini et al., 1993; Brack & Rieber, 1993; Gaetani, 1993), one may indirectly conclude that the time interval comprised of the Trinodosus zone-*Lardaroceras* beds (*sensu* Balini, 1992a)-Reitzi/Kellnerites Zone-Nevadites Zone is probably represented in the Han-Bulog Limestone of Hydra. This conclusion is consistent with the latest Pelsonian-latest Illyrian/Ladinian age of the unit recently inferred from conodonts distribution (Angiolini et al., 1992).

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(1) Because no identifications are reported on the labels, the original determinations made by Renz in 1931 are difficult to interpret. Together with the specimens, 8 photographic plates, mounted and almost ready for publication, are deposited. Unfortunately no plate explanation is available (R. Panchaud, NMB, pers. comm.).

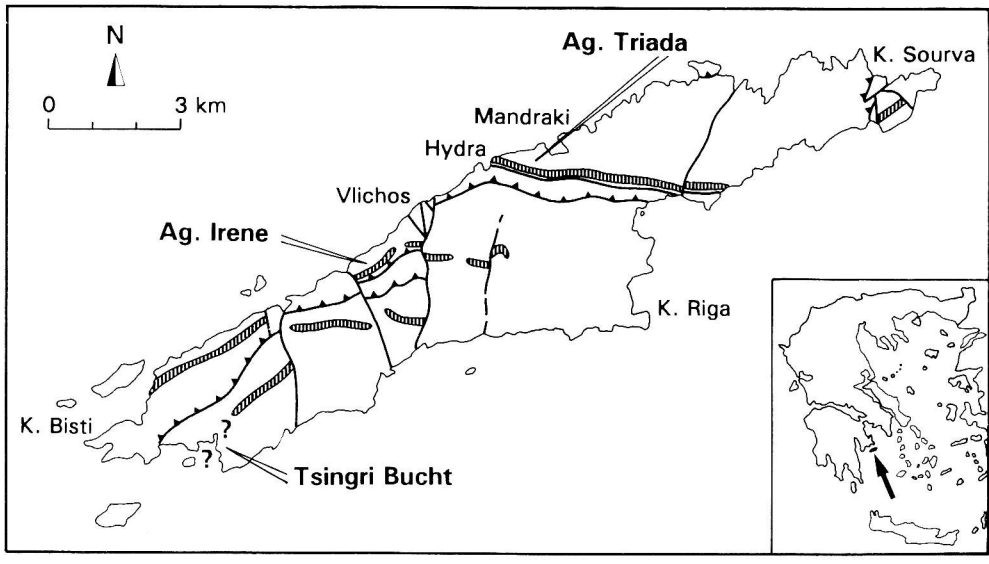

Fig. 1 - Geographical location of Hydra island and position of the localities quoted in the text. The structural scheme and simplified distribution of the Han-Bulog Limestone (striped area) is from Angiolini et al. (1992). For the stratigraphical setting of the Han-Bulog Limestone see Wendt (1973) and Angiolini et al. (1992). Uncertainty in the position of the locality "Tsingri Bucht" is due to the very different interpretations of the geology of the bay of Tsingri available from literature (Renz & Reichel, 1946; Römermann, 1968; Richter & Füchtbauer, 1981; Angiolini et al., 1992).

The genera *Kellnerites* and *Nevadites* are stratigraphic markers common in the western Tethys. They have also been recognized in Triassic red nodular limestones of the Dinarides and Hellenides (Hauer, 1887 and 1896; Krystyn & Mariolakos, 1975; Krystyn, 1983). On the other hand the genera *Megaceratites* and *Ronconites* were reported only from the Prezzo Limestone from the Southern Alps (Balini, 1992b), whereas *Asseretoceras camunum* also from the Buchenstein Formation of Bakony (Hungary) (Vörös, 1993; Budai et al., 1993). This is the first report of these forms from the Han-Bulog Limestone of Hydra. These observations lead me to conclude that from a paleoecological point of view *Asseretoceras*, *Megaceratites* and *Ronconites* were not confined to intraplatform basin environment, such as the depositional environment of the Prezzo Limestone and Buchenstein Formation, but they were also present in deeper environments. Then their stratigraphical significance is potentially high.

It is worth noting that, although since the last century a great deal of work has been devoted to the ammonoid fauna of the Schreyer Alm and Han-Bulog Limestones of Austria, former Jugoslavia and continental Greece (some tens of papers and monographs based on several thousands of ammonoids), specimens referable to the genera *Asseretoceras*, *Megaceratites* and *Ronconites* were apparently never illustrated from these localities. At present two possible solutions can be suggested: either that in these localities the stratigraphic interval corresponding to the range of *Asseretoceras*, *Megace-*

ratites and *Ronconites* is not represented due to a hiatus, or that this stratigraphic interval is sedimentologically documented, but, due for instance to unfavorable diagenesis, ammonoids are not preserved.

Systematic descriptions

The family-group taxonomy is taken from Tozer (1981). His comprehensive review is commonly accepted, notwithstanding some characters of the family Ceratitidae (i.e., the position into the subfamily Paraceratitinae of the genus *Nevadites* Smith, 1914) should in my opinion require a revision.

Repository of the collection. Naturhistorisches Museum Basel, Augustinergasse 2, 4001 Basel, Switzerland. The inventory numbers of the Museum (acronym NMB) are also provided.

Locality of collection. All the described specimens were collected at Aghia Irene (Fig. 1), which is located on the right hand side of the valley leading to Ormos Palamida, southwest of Vlichos.

Dimensions. If no otherwise specified the measurements refer to specimen with test. All the measurements, except for SGR, are in mm. D= diameter; H= max. whorl height in D; h=min. whorl height in D; U=umbilical width; W=whorl width in H; SGR=((H-h)/h)x100.

Order **Ceratitida** Hyatt, 1884

Superfamily *Ceratitaceae* Mojsisovics, 1879

Family *Ceratitidae* Mojsisovics, 1879

Subfamily *Paraceratitinae* Silberling, 1962

Genus *Asseretoceras* Balini, 1992

Asseretoceras camunum (Assereto, 1963)

Pl. 1, fig. 1a, b

1949 *Ceratites brembanus* - Riedel, pl. 1, fig. 3.
1963 *Bulogites camunus* Assereto, p. 46, pl. 4, fig. 4a-d, 5a-b; text-fig. 15, 16.
1992b *Asseretoceras camunum* - Balini, fig. 2(1a-b), 3a.
1993 *Asseretoceras camunum* - Vörös, pl. 1, fig. 1, 2.

Material. One specimen (NMB J 31389) and one fragment (NMB J 31631). The specimens are almost completely covered by recrystallized test.

Description. The coiling is nearly evolute, with very slow growing rate. The whorl section is subrectangular with subvertical umbilical wall and relatively narrow ventral side. The venter is slightly roundly elevated. The ornamentation well agrees with the style of the specimens from the Southern Alps (Balini, 1992b, pp. 181-183).

Only one suture line is exposed. Unfortunately it is not well preserved and cannot be drawn. However, on the lateral side three saddles and three lobes have been counted.

Remarks on synonymy. The restricted stratigraphic distribution of the genus *Asseretoceras* (Balini, 1992a) and the wide morphological variability observed in the field suggest that most of the forms identified as *Bulogites* and *Reiflingites* by Assereto (1963) could more correctly be assigned to the species *A. camunum*. At present only a preliminary synonymy is provided, being the revision of the whole group still in progress.

Genus *Megaceratites* Balini, 1992

Megaceratites aff. **fallax** Balini, 1992

Pl. 1, fig. 3a, b

Material and preservation. One incomplete specimen (NMB J 31629) almost completely covered by recrystallized test.

Description. The specimen shows the change of coiling rate typical of the genus: from involute (inner whorls) to evolute (outermost whorl). Due to the incompleteness of the specimen the transition from involute to evolute stage cannot be studied in detail. However, it takes no more than 270° and causes SGR to fall almost to zero (Pl. 1, fig. 3a).

The section of the inner whorls is subtrapezoidal, and gradually becomes subrectangular on the outer volution. The umbilical wall of the inner whorls is overhanging, so that, when the egression starts, it becomes steep (slightly less than 90°).

The ornamentation of the inner whorls is made of very weak and sinuous ribs and umbilical, lateral and ventrolateral nodes. On the outer whorl the ribs are both primary and intercalatory. On the outer whorl the umbilical nodes are reduced, while the lateral and ventrolateral nodes, and the ribs become much stronger. The suture line is not exposed.

Dimensions:

Specimen	D	H	h	U	W	SGR	U/D
NMB J 31629	~66.9	~23.5	21.9	21.5	-	~7.3	~0.32

Discussion. This new specimen shows an evolute and strongly ribbed stage of growth with no widening of the ventral area and increasing of whorl height, which are features typically observed in *M. fallax* (Balini, 1992b, pp. 186-187, fig. 4). For this reason the specimen has not been fully attributed to the type species of the genus *Megaceratites*.

Genus *Ronconites* Balini, 1992

Ronconites sp. n. A

Pl. 2, fig. 1a, b; Text-fig. 2b

Material and preservation. One specimen (NMB J 31391) almost completely covered by recrystallized test. One of the two sides is not exposed. The specimen is slightly elliptical due to fractureless lateral deformation (Seilacher et al., 1976).

Description. The coiling of the inner whorls is involute. Subsequently, due to a slow umbilical egression, it gradually becomes almost evolute. The whorl section is subrectangular. The umbilical wall is subvertical, but the periumbilical margin is weakly rounded.

Ribs and three series of nodes can be recognized. The course of the ribs is slightly sinuous to almost straight. Most of them are primary while the intercalatory ribs are very rare. The umbilical nodes are visible on the inner whorls, and progressively disappear on the outer whorl. The lateral nodes, covered on the inner whorls, become exposed by the umbilical egression at the beginning of the last but one whorl. The ribs and the ventrolateral nodes become very strong during the course of the last whorl (Fig. 2b). The ventrolateral nodes are slightly alternating on the opposite sides of the venter.

The suture line is not exposed.

Dimensions:

Specimen	D	H	h	U	W	SGR	U/D
NMB J 31391	103.1	38	29.3	35.4	-	29.6	0.34

Discussion. The attribution of the specimen to the genus *Ronconites* is made on the basis of the large size, the subrectangular whorl section and the wide ventral side. With this respect this specimen is very similar to the holotype of *R. tridentinus* (see Balini, 1992b, fig. 8a-b). The umbilical egression is slightly more evident than in *R. tridentinus* [see Balini, 1992b, fig. 8b and fig. 9 (2a, 3)]. The strong ornamentation, which is not shown by *R. tridentinus*, is not considered significant for a separation at a generic rank.

The specimen surely belongs to a new species. However the lack of detailed informations concerning the variability of the species, its ontogenesis as well as the locality of collection and the stratigraphic position, does not allow to formally institute a new species.

Genus *Kellnerites* Arthaber, 1912

"Kellnerites" sp. ind.

Pl. 1, fig. 2a, b

? 1904 *Ceratites trinodosus* - Martelli, p. 80, pl. 5, fig. 1a,b.

Material and preservation. One specimen (NMB J 31390) almost completely covered by recrystallized shell wall. The specimen lacks the body chamber.

Description. The specimen is fairly involute and compressed. The whorl section is almost semielliptical. The umbilical wall is vertical to slightly overhanging and the

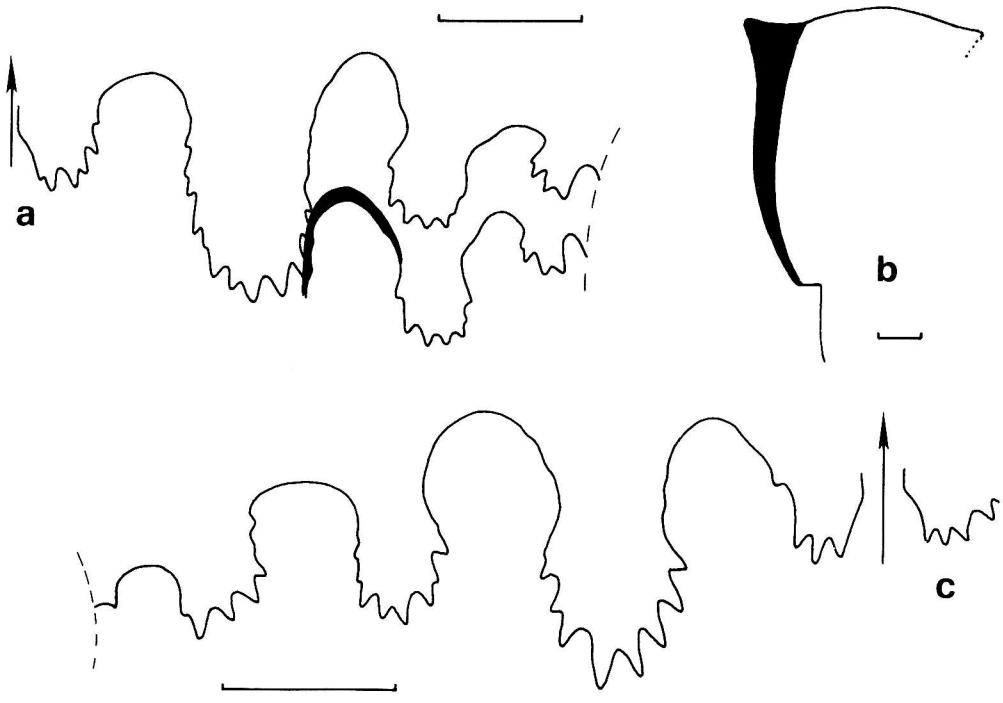

Fig. 2 - a) Suture line of *Ceratitidae* gen. ind. sp. ind., NMB J 31388: the thickness of the whole septum is shown only for the second saddle of the oldest suture; bar scale=0.5 cm. b) Left side *Ronconites* sp. n. A, NMB J 31391 (the right side is covered); bar scale=0.5 cm. c) Suture line of "*Ceratites*" aff. *falcifer*, NMB J 31630; bar scale=0.5 cm. The dashed line follows the periumbilical margin.

periumbilical margin is rounded. The shoulder is almost lacking and the strongly keeled ventral side is very narrow.

The ornamentation follows the typical pattern of *Kellnerites*. Four series of nodes can be recognized. The lateral nodes are very close to the umbilical series (about 1/4 of whorl height). The third series (2nd lateral), located between the lateral and the ventrolateral nodes, is made of radial bulges of the ribs. The ventrolateral spiny nodes are often broken. The slightly sinuous ribs can be divided into primary, intercalatory and bifurcate types. The branching-point of the bifurcate ribs is located on the first lateral node. All the ribs suddenly turn forward at the ventrolateral node. The ventral keel is remarkably strong and elevated over the ventrolateral nodes.

Due to the preservation of the test the suture line is not well exposed. However, a cortical breakage at the end of the preserved last whorl allows the identification of three saddles on the lateral side.

Dimensions:

Specimen	D	H	h	U	W(orn.)	SGR	U/D
NMB J 31390	48.8	19.5	13.4	15.9	~15.5	45.5	0.32

Discussion. The specimen agrees with *Kellnerites bosnensis* (Hauer, 1887) (type of the genus *Kellnerites*) and with the species of the same group described by Hauer [*K. halilucensis*, *K. fissicostatus*, *K. bispinosus*, *K. angustecarinatus* (Hauer, 1896)] as concerns the ornamentation, but it differs for the coiling and whorl section. The species of the group of *K. bosnensis* are almost evolute with sub-rounded to oval whorl section. This brings the lateral side to gently slope towards the umbilical seam without any distinguishable periumbilical margin. On the basis of these differences the attribution of the discussed specimen to *Kellnerites* s.s. is not fully justified. However, the diagnosis of *Kellnerites* has been recently reviewed and enlarged by Brack & Rieber (1993), who refer to as *Kellnerites* also involute forms with subrectangular whorl section and a distinct, nearly perpendicular umbilical wall [*K. bagolinensis* Brack & Rieber, 1993 (p. 470, pl. 6, fig. 1-3,9; text-fig. 15o, 16e)].

Genus *Nevadites* Smith, 1914

Nevadites sp. ind.

Pl. 1, fig. 4a, b

Material and preservation. One specimen (NMB J 31627), preserved as internal mould in part covered by remains of recrystallized shell wall.

Description. The specimen is evolute and the whorl section is subrounded. The umbilical seam of the last whorl follows the spiral series of the ventrolateral nodes of the last but one whorl. The ventral side between the ventral nodes is narrow and fairly depressed.

Breakages probably due to inaccurate preparation do not allow a full description of the ornamentation. The nodes can be recognized only on the second half of the preserved body chamber and on the inner whorls. On the second half of the body chamber three series of nodes can be distinguished in umbilical, ventrolateral and ventral position. On the inner whorls only umbilical and ventrolateral nodes are visible, being the ventral series probably covered by the outer volution. Most of the ventral nodes seem to occupy opposite positions on both sides. The ribs are almost straight. On the inner whorls the ribs are primary and bifurcate, while on the body chamber only the primary ribs seem to be present. Not all the primary ribs arise from an umbilical node, but all the ribs show ventrolateral and ventral nodes. On the body chamber the ribs show a variable degree of strengtheness.

The suture line is composed of three saddles on the lateral side.

Discussion. The poor quality of preservation does not allow a full classification of the specimen. The narrow ventral side lead to a comparison with *N. secedensis* Brack & Rieber (1993, p. 482, pl. 11, fig. 4-8; pl. 12, fig. 3-4,8; text-fig. 15k, 15q, 17d) and *N. crassiornatus* Brack & Rieber (1993, p. 483, pl. 12, fig. 1-2; text-fig. 15p). However *N. secedensis* usually does not show umbilical nodes on the body chamber, while the ornamentation of *N. crassiornatus* is much stronger.

"**Ceratites**" aff. **falcifer** Hauer, 1896

Pl. 2, fig. 3; Text-fig. 2c

Material. One incomplete specimen (NMB J 31630).

Description. The coiling is rather involute. The compressed whorl section is subtrapezoidal and the venter is weakly rounded. The umbilical area is covered and no information about the inner whorls is available.

The ornamentation is made of ribs and two series of nodes in umbilical and ventrolateral position. The ribs are proverse and sinuous, and can be of primary and intercalatory type. Couples of primary ribs arise from each umbilical node.

The suture line is constituted of four saddles on the lateral side. The elements can be seen in details only on the left side of the specimen (Fig. 2c). The inner side of the first lateral saddle and the outer side of the second lateral saddle show very few faint undulations.

Discussion. The specimen fully agrees with "*Ceratites*" *falcifer* Hauer (1896, p. 258, pl. 8, fig. 5, 6) except for some details concerning the suture line. The saddles of the "*C.*" *falcifer* type are fully rounded (ceratitic), while the first and second lateral saddles of the specimen from Hydra are slightly irregular.

The taxonomical value of these differences cannot be specified without data on both sides of the specimen and without the analysis of the intraspecific varibility. Some Anisian ammonoids show continuous variation from ceratitic to frilled saddles (i.e., *Lardaroceras* Balini, 1992a) while this variability is not shown by other groups.

Ceratitidae gen. ind. sp. ind.

Pl. 2, fig. 2; Text-fig. 2a

Material and preservation. One specimen (NMB J 31388) preserved as internal mould in part covered by recrystallized shell remains.

Description. The shell is involute with a fairly subtrapezoidal whorl section. The umbilical wall is overhanging to perpendicular and the periumbilical margin is abrupt but not angular. The ventral side is weakly rounded. A very weak umbilical egression takes place at the last 160°-170° of the outermost preserved whorl, making the usually covered lateral nodes visible.

The ornamentation consists of ribs and three series of nodes in umbilical, lateral and ventrolateral position. The slightly proverse and sinuous ribs can be distinguished in primary, intercalatory and bifurcate types. The primary ribs start at the umbilical nodes: one, or more rarely, two from each node. Bifurcations occur on the lateral nodes, at about 1/3 of whorl height. At the same height on the lateral side the intercalatory ribs appear, but they do not bear lateral nodes. All the ribs end in correspondence of the ventrolateral nodes, which are located on the shoulder. Between the

periumbilical margin and the shoulder the inter-rib space is constant while the width of the ribs gradually increases.

About 10 umbilical nodes and 11 lateral nodes per half whorl have been counted. The number of ventrolateral nodes can be estimated at about 20 to 22.

Three and a half to four saddles are exposed on the lateral side between the ventrolateral and the periumbilical margins (Fig. 2a). The frilling of the lateral lobe seems to climb up towards the sides of the first and second lateral saddles.

Dimensions:

Specimen	D	H	h	U	W	SGR	U/D
NMB J 31388	60.75*	27.5*	17.9*	15.35	15.6*	53.63*	0.25*

* shell in part lacking

Discussion. The specimen is very similar to "*Ceratites*" aff. *falcifer* from which it differs for the presence of lateral nodes. As regard the generic attribution, both the specimens seem to be morphologically close to *Bulogites* Arthaber, 1912. However, the typical *Bulogites* [i.e., *B. multinodosus* (Hauer, 1892) and *B. zoldianus* (Hauer, 1851)] do not show a whorl section as compressed as the one of the two specimens here under discussion. Moreover on the lateral side the ceratitic suture line of *Bulogites* is composed by only three saddles.

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PLATE 1

Fig. 1 - *Asseretoceras camunum* (Assereto, 1963). NMB J 31389, Han-Bulog Limestone, Aghia Irene. a) Lateral view; b) ventral view of the second and third quarter of the last whorl; x 1.

Fig. 2 - *"Kellnerites"* sp. ind. NMB J 31390, Han-Bulog Limestone, Aghia Irene. a) Lateral view; b) ventral view; x 1.

Fig. 3 - *Megaceratites* aff. *fallax* Balini, 1992b. NMB J 31629, Han-Bulog Limestone, Aghia Irene. a) Lateral view; b) ventral view; x 1.

Fig. 4 - *Nevadites* sp. ind. NMB J 31627, Han-Bulog Limestone, Aghia Irene. a) Lateral view; b) ventral view; x 1. Dotted line shows the position of a couple of ventral nodes.

All the specimens have been whitened with Ammonium Chloride.
The arrow shows the position of the last suture line, when it is visible.

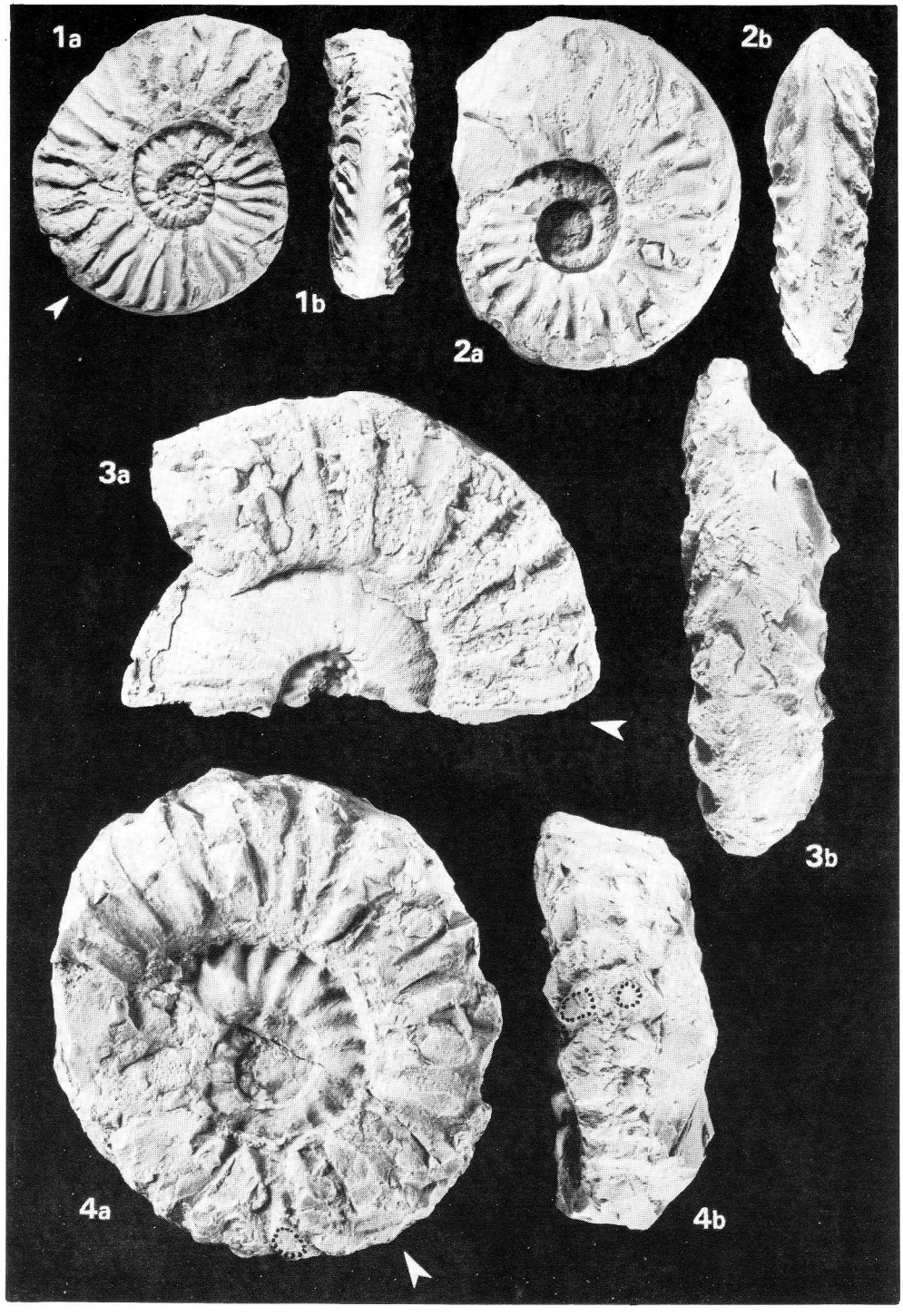
PLATE 2

Fig. 1 - *Ronconites* sp. n. A. NMB J 31391, Han-Bulog Limestone, Aghia Irene. a) Lateral view; b) ventral view; x 1.

Fig. 2 - *Ceratitidae* gen. ind. sp. ind. NMB J 31388, Han-Bulog Limestone, Aghia Irene. Lateral view; x 1.

Fig. 3 - *"Ceratites"* aff. *falcifer* Hauer, 1896. NMB J 31630, Han-Bulog Limestone, Aghia Irene. Lateral view; x 1.

All the specimens have been whitened with Ammonium Chloride.
The arrow shows the position of the last suture line, when it is visible.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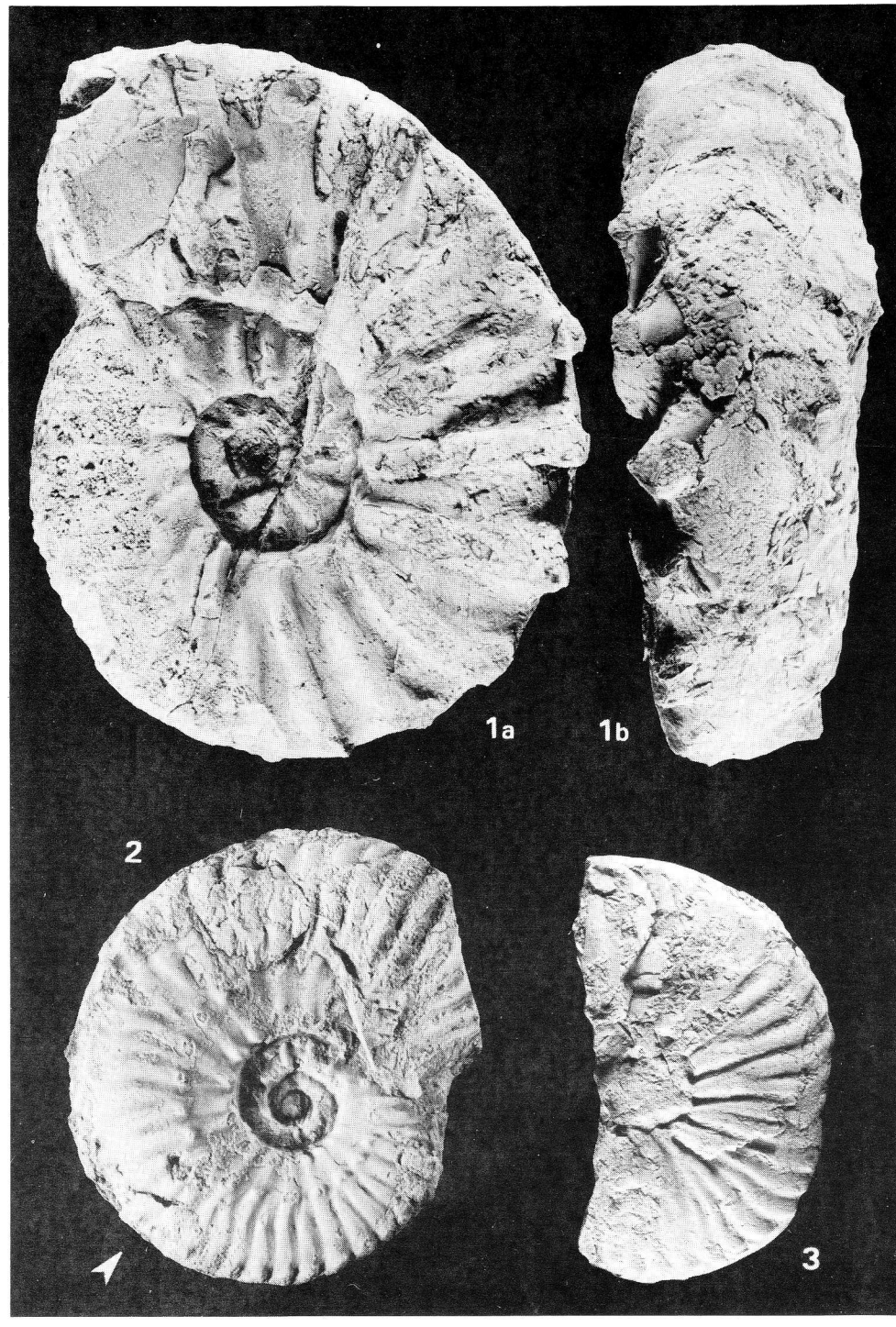
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