

***Xerticeras* gen. nov., a new genus
of micromorphic heteromorph ammonite
(Ancyloceratina, Ancyloceratidae)
from the lower Aptian of Spain**

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Abstract: Biostratigraphical and paleontological studies of lower Aptian material from the Eastern Iberian Chain (Spain) have revealed the presence of a new genus of micromorphic heteromorph ammonite: *Xerticeras* gen. nov. (type species: *Xerticeras salasi* sp. nov.). This new taxon comes from the *Deshayesites deshayesi* and *Dufrenoya furcata* ammonite zones. The size difference observed in the population is considered due to sexual dimorphism.

Key Words: Ancyloceratina; heteromorph ammonite; dimorphism; lower Cretaceous; Aptian; Spain.

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Resumen: *Xerticeras* gen. nov., un nuevo género de ammonite heteromorfo micromórfico (Ancyloceratina, Ancyloceratidae) del Aptiense inferior de España.- Los estudios bioestratigráficos y paleontológicos de los materiales del Aptiense inferior de la Cadena Ibérica oriental (España) han puesto de manifiesto la existencia de un nuevo género de un ammonite heteromorfo micromórfico: *Xerticeras* gen. nov. (especie tipo: *Xerticeras salasi* sp. nov.). Este nuevo taxón se presenta en las zonas de ammonites *Deshayesites deshayesi* y *Dufrenoya furcata* en el área de estudio. La diferencia de tamaño observada en la población se considera una expresión de dimorfismo sexual.

Palabras clave: Ancyloceratina; ammonite heteromorfo; dimorfismo; Cretácico inferior; Aptiense; España.

Résumé : *Xerticeras* gen. nov., un nouveau genre d'ammonite hétéromorphe micromorphe (Ancyloceratina, Ancyloceratidae) de l'Aptien inférieur d'Espagne.- L'étude biostratigraphique et paléontologique des dépôts de l'Aptien inférieur de la chaîne ibérique orientale (Espagne) a révélé l'existence d'un nouveau genre d'ammonite hétéromorphe micromorphe : *Xerticeras* gen. nov. (espèce type : *Xerticeras salasi* sp. nov.). Ce nouveau taxon est présent dans les zones d'ammonites à *Deshayesites deshayesi* et *Dufrenoya furcata* de la région étudiée. La différence de taille constatée dans la population est considérée comme l'expression d'un dimorphisme sexuel.

Mots-clefs : Ancyloceratina ; ammonites hétéromorphes ; dimorphisme ; Crétacé inférieur ; Aptien ; Espagne.

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Introduction

During the completion of the Ph.D. of the second author, J.A. MORENO-BEDMAR, an unknown micromorphic heteromorph ammonoid was found in the lower Aptian material of the Mola Murada section, which is located close to the town of Xert. Some other specimens were also collected later by D. TOLÓS LLÁDSER. In 2012, fieldwork was undertaken with the sole intention to collect additional specimens of this unknown taxon. In this last campaign more than one hundred specimens were collected. A new section containing this new taxon, Mola Rodona, was sampled in detail. As the distribution of heteromorph ammonoids appears to have been controlled by particular local factors and environmental conditions, the distribution of this species is sporadic and erratic. The description of this new taxon adds to the knowledge on the heteromorph ammonoids of the lower Aptian of the Maestrat.

Geological setting

The study area is located in the Maestrat Basin (Eastern Iberian Chain, Eastern Spain). This basin was developed during the Late Jurassic–Early Cretaceous rifting phase related to the opening of the Central Atlantic and North Atlantic (e.g., SALAS and CASAS, 1993; SALAS *et al.*, 2001). This rifting stage controlled the development of the basin, which was divided into seven sub-basins (SALAS and GUIMERÀ, 1996), which are shown in Figure 1. The ammonoid material studied in this paper comes from the Salzedella Sub-basin, which is the depocenter of the Maestrat Basin. The ammonoids were collected from the middle part of the Margas del Forcall Formation that was deposited in a relatively deep water hemipelagic environment. The sedimentation of the Forcall Formation coincides with an interval of rapid subsidence and also with the early Aptian Tethyan transgression (BOVER-ARNAL *et al.*, 2010). This formation shows an alternation of marls, marly limestones, limestones and silty/sandy limestones, with abundant orbitolinids and ammonites. The ammonoid record of Forcall Formation was recently studied in detail by MORENO-BEDMAR *et al.* (2009, 2010). The ammonoids studied in this paper come from two sections in close proximity: Mola Murada (co-ordinates: 40°32' 38.46"N, 0°10'33.95"E, Figs. 1, 2 and 4) and Mola Rodona (co-ordinates: 40°32'48.20"N, 0°10' 42.75" E, Figs. 1, 3 and 4). Both sections are located near the village of Xert, Baix Maestrat, Castelló.

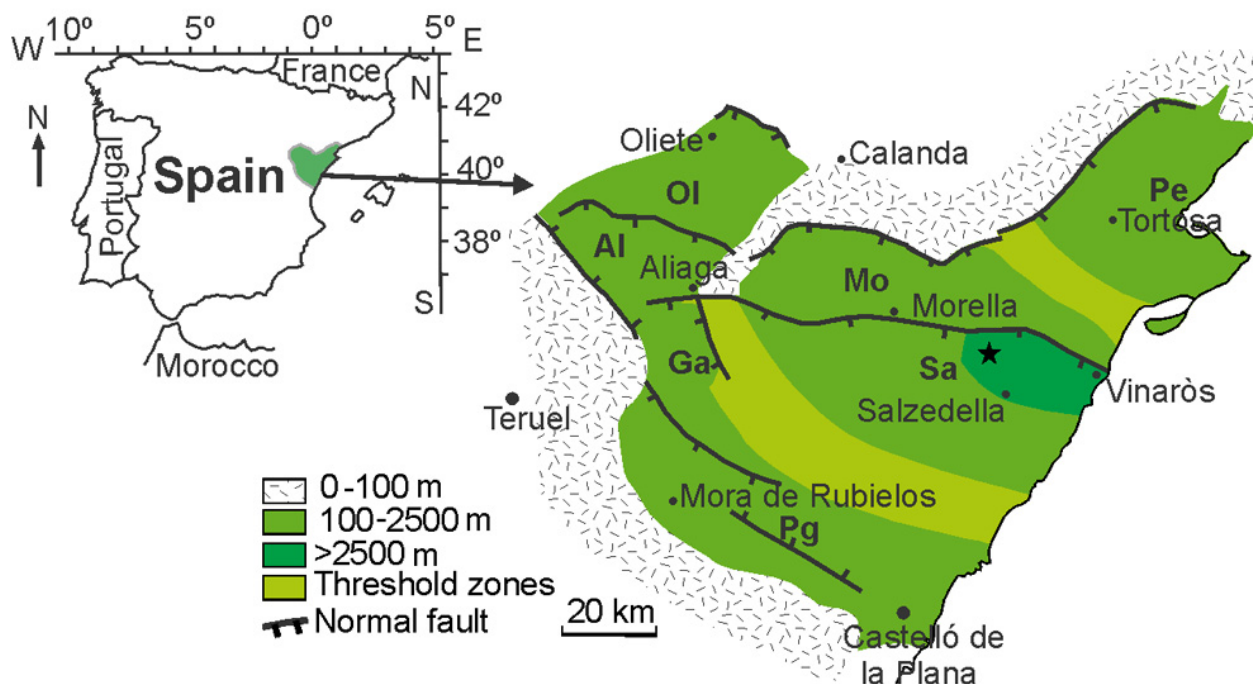


Figure 1: Simplified geological map of the Maestrat Basin (modified after SALAS *et al.*, 2001) that shows the seven sub-basins. The black star shows the location of the two studied sections.



Figure 2: Mola Murada.



Figure 3: Mola Rodona.

Ammonite biostratigraphy

Two zones are recognized in the studied sections:

- *Deshayesites deshayesi* Zone. This zone contains the species: *Pseudosaynella raresulcata* (d'ORBIGNY, 1841), *Pseudosaynella bicurvata* (MICHELIN, 1838), *Pseudosaynella* sp. (Pl. 4, fig. N), *Pseudohaploceras* sp. (Pl. 4, fig. M), *Ammonitoceras* sp., *Macroscaphites striasulcatus* (d'ORBIGNY, 1841), *Toxoceratoides royerianus* (d'ORBIGNY, 1841) (Pl. 4, fig. R), *Xerticeras salasi* gen. nov, sp. nov. (Pl. 1, figs. A-O; Pl. 2, figs. A-U; Pl. 3, figs. A-B, H-P, R), *Chelonicerases cornuelianum* (d'ORBIGNY, 1841), *Chelonicerases* sp. (Pl. 4, fig. Q) and *Deshayesites deshayesi* (d'ORBIGNY, 1841) (Pl. 3, figs. Q, S-Y; Pl. 4, figs. A-B, D-E, G-L, O).
- *Dufrenoyia furcata* Zone. The following species were recognized in this zone: *Toxoceratoides royerianus* (Pl. 4, fig. P), *Xerticeras salasi* gen. nov, sp. nov. (Pl. 3, figs. C-G), *Chelonicerases cornuelianum* (d'ORBIGNY) (Pl. 4, fig. S) and *Dufrenoyia furcata* (J. de C. SOWERBY, 1836) (Pl. 4, figs. C, F).

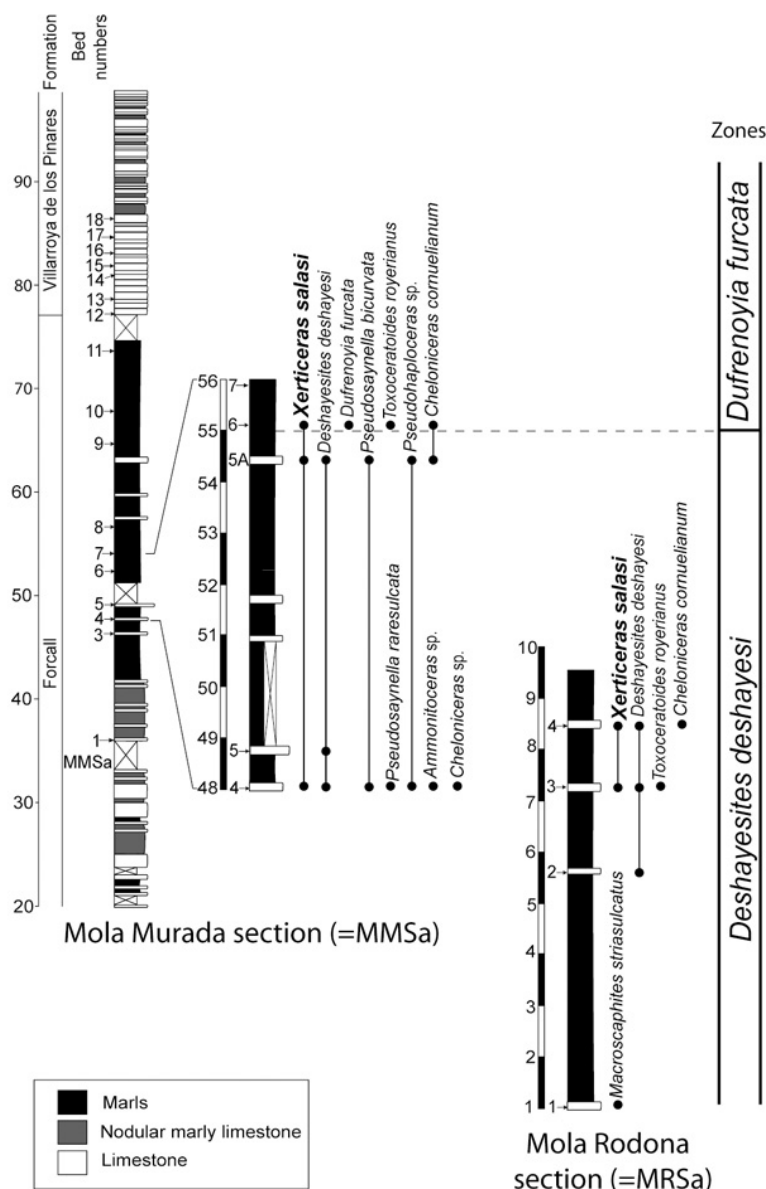


Figure 4: Correlation across the two stratigraphic sections studied, Mola Murada (MMSa) and Mola Rodona (MRSa). Datum at the boundary of *Deshayesites deshayesi* and *Dufrenoyia furcata* zones. The more complete at Mola Murada (with its bed numbers) was modified after MORENO-BEDMAR *et al.* (2010).

Discussion: The ammonoid assemblages from each zone are typical of these biostratigraphical units. However, we must remark on the presence of two specimens determined as *Chelonicerases* sp. (Pl. 4, figs. Q, S). In both of these specimens we can observe in the ventral region the incipient differentiation between primary and secondary ribs (especially in the Pl. 4, fig. Q). This characteristic becomes well developed in genus *Epicheloniceras* CASEY, 1954. We consider

these specimens as transitional forms between the genus *Chelonicer* HYATT, 1903, and *Epicheloniceras* CASEY, 1954; they demonstrate a gradual evolution between the two genera. In the present case the two specimens are clearly closer to the *Chelonicer* genus and are placed in this genus under open nomenclature. A similar situation, that shows this transitional evolution between *Chelonicer* HYATT, 1903, and *Epicheloniceras* CASEY, 1954, has been reported by others workers (e.g., CASEY *et al.*, 1998; MORENO-BEDMAR *et al.*, 2012, 2013).

Paleontological study

Order Ammonitida ZITTEL, 1884

Suborder Ancyloceratina WIEDMANN, 1966

Superfamily Ancyloceratoidea GILL, 1871

Family Ancyloceratidae GILL, 1871

Xerticeras gen. nov.

Derivatio nominis: From the village of Xert, Baix Maestrat, Castelló, Comunidad Valenciana, Eastern Spain.

Diagnosis: Micromorphic heteromorph ammonite with aspinoceratic or acrioceratic coiling and showing dimensional dimorphism. The conical spire is proportionally important and corresponds to the whole phragmocone. Ornamentation consists of fine, single, sharp, non-tuberculated ribs on all the parts of the shell, except on the hook where we can observe rare bifurcations or fasciculations. On the shaft, ribs are irregular; there are bundles of 2 to 4 raised ribs. On the crozier, the ribs are more evenly spaced.

Distribution: Lower Aptian, *Deshayesites deshayesi* and *Dufrenoya furcata* zones of Mola Murada and Mola Rodona sections (Eastern Iberian Chain, Eastern Spain).

Remarks, comparisons: We assign *Xerticeras* gen. nov. to the Ancyloceratidae because we believe that the families Acrioceratidae and Helicancylidae are most likely polyphyletic. In recent works, there are divergent views: KLEIN *et al.* (2007) put Helicancylidae in synonymy with Ancyloceratidae, whereas BERT (2009) considers Acrioceratidae as a synonym of Helicancylidae, and VERMEULEN (2010) does not recognize the validity of Helicancylidae. In fact these two families contain heteromorphic ammonite genera with common characteristics, including their small size and an ornamentation consisting of non-tuberculate ribs and/or uni-, bi-, trituberculate ribs in more or less regular alternation. Moreover the phyletic lineages recognized by some authors who have recently studied ammonites belonging to these families

(VERMEULEN, 2004, 2006, 2009; BERT, 2009; LUKENEDER & LUKENEDER, 2013) remain hypothetical and therefore cannot form the basis of evolutionary lineages. The Acrioceratidae and Helicancylidae very probably include both microconch taxa linked to a sexual dimorphism as well as taxa constituting full generic status.

Volgoceratoides BARABOSHKIN & MIKHAILOVA, 2002 (type species: *Volgoceratoides schilovkensis* BARABOSHKIN & MIKHAILOVA, 2002), is an Aptian micromorphic heteromorph genus with an aspinoceratic shell, ornamented with single ribs on the shaft and bifurcate ribs on the crozier. Ribs have one to two rows of tubercles (lateral and marginal).

Comparison of *Xerticeras* gen. nov. with the other small-sized Aptian heteromorph genera shows that this new genus is well defined:

- *Toxoceratoides* SPATH, 1924 (type species: *Toxoceras royerianus* d'ORBIGNY, 1842), typically has a larger labeceratic to toxoceratic shell. The ornamentation of the shaft consists of a more or less regular alternation of main trituberculate ribs and intermediate generally inner ribs. On the hook and on its returning part, ribs are single or bi- or trifurcate from a single peridorsal tubercle;
- *Tonohamites* SPATH, 1924 (type species *Hamites decurrens* SPATH, 1924), must be restricted to the type species according to AVRAM (2002). It is close to *Toxoceratoides* but the coiling is more labeceratic and the body chamber is ornamented by single rounded or flattened thick ribs;
- *Raymondcaseyites* AVRAM, 2002 (type species *Tonohamites limbatus* CASEY, 1961), contains species previously referred to *Tonohamites*. In the view of AVRAM (2002) *Raymondcaseyites* is like *Tonohamites* but the tuberculation is more discrete and generally confined to the ventral margins of the shell. In some species described as *Tonohamites* (e.g., *T. koeneni* KLINGER & KENNEDY, 1977, non CASEY, 1961, and *T. ? caseyi* KLINGER & KENNEDY, 1977) the tuberculation is absent. We think that the generic attribution of these taxa could be revised;
- *Hamiticeras* ANDERSON, 1938 (type species: *Hamiticeras pilsbryi* ANDERSON, 1938), is composed of a straight or slightly curved shaft followed by a long terminal hook. On the shaft the ornamentation consists at first of single, non tuberculate ribs followed by an alternation of trituberculate ribs and non tuberculate ribs. On the retroversed shaft of the crozier, the ribs are single, strong and non tuberculate;

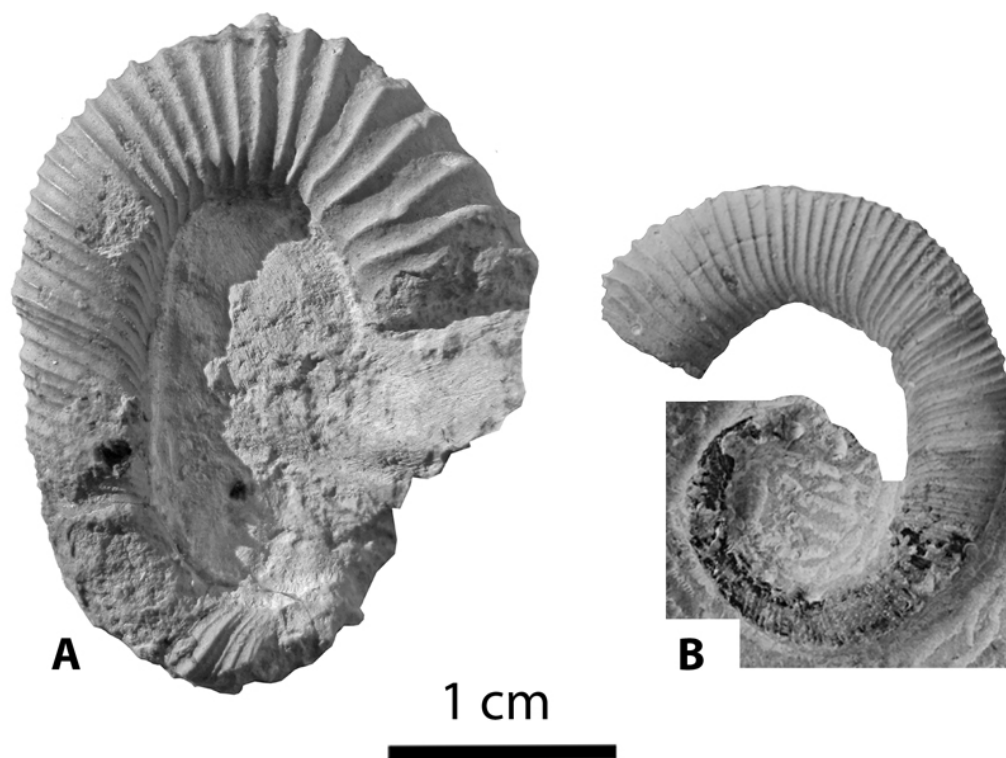


Figure 5: *Xerticeras salasi* gen. nov. sp. nov. A - specimen E(C)014 coll. RUIZ; B - specimen number 70 coll. TOLÓS LLÁDSER. All from lower Aptian, *Deshayesites deshayesi* Zone from Mola Murada section.

- *Helicancylus* GABB, 1869 (type species: *Ptychoceras aequicostatum* GABB, 1864), is characterized by acrioceratic coiling. The ornamentation consists in equal, single ribs with a latero-ventral tubercle which disappears on the hook. This last part of the shell is ornamented by single more spaced, non tuberculate ribs.

We refer to the discussions of CASEY (1961), KLINGER & KENNEDY (1977), AGUIRRE URRETA (1986), AVRAM (2002), KAKABADZE & HOEDEMAEKER (2004) and BERT (2009) about the taxonomic problems associated with these genera.

Some ornamental affinities can be also found with the acrioceratic genus *Hoplocrioceras* SPATH, 1924 (type-species: *Hamites Phillipsi* PHILLIPS, 1829), populations of which have been described recently and figured by KAKABADZE & HOEDEMAEKER (2010): the ornamentation consists of single fine ribs on the spire, which are fasciculate with peri-dorsal swellings and intermediate ribs on the shaft and the hook. But the species discussed by these authors is larger and occurs in the Lower Barremian of England and Germany.

***Xerticeras salasi* gen. nov. sp. nov.**

Pl. 1, figs. A-O; Pl. 2, figs. A-U;
Pl. 3, figs. A-N, O-P, R; Fig. 5; Table 1

Holotype: Sample PUAB 88836 (Pl. 1, fig. I), lower Aptian, *Deshayesites deshayesi* Zone from Mola Murada section.

Derivatio nominis: The species is dedicated to Ramon SALAS ROIG for his contributions to the geology of the Maestrat Basin.

Locus typicus: Mola Murada section.

Stratum typicum: Mola Murada section, bed number MMSa 4.

Studied material: 145 specimens, PUAB 88800 to 88822, PUAB 88835 to 88840, PUAB 88842 to 88868, PUAB 88890 to 88906, PUAB 88945 to 88951, PUAB 88959 to 88980, PUAB 89044 to 89047, lower Aptian, *Deshayesites deshayesi* Zone. Samples PUAB 88909 to 88930, PUAB 88990 to 89006, PUAB 89044 to 89047, lower Aptian, *Dufrenoya furcata* Zone [PUAB=Paleontology collections of Universitat Autònoma de Barcelona, Spain]. Sample E(C)014 coll. RUIZ and samples 70 and 71 coll. TOLÓS LLÁDSER, lower Aptian, *Deshayesites deshayesi* Zone from Mola Murada section.

Diagnosis: Same as the genus.

Dimensions: Dimensions of some specimens are given in mm. The abbreviations used here are as follows: Ht = total height; ha = aperture height; M = macroconchs; m = microconchs; C = estimated

PUAB	M m	Ht	ha	
88835	M	29	6.3	holotype
88836	M	24.45	7.3	
88840	M	C 27	6.5	
88842	M	C 36	9.65	
88890	M	22.85	6.85	
88891	M	29.45	6.8	
88894	M	28.65	8.85	
88860	M	C 23.45	6.5	
89044	M	22.2	6.75	
88802	m	C 14.2	3.4	
88814	m	C 14.5	3.6	
88837	m	15.9	3.55	
88838	m	C 15	4.1	
88845	m	C 14.9	3.3	
88846	m	C 11.9	2.7	
88897	m	C 13.6	3.6	

Table 1: Dimension of some specimens of *Xerticeras salasi* gen. nov. sp. nov. (in mm)

Description: Very small heteromorphic ammonite; the adult macroconch is about 23 to 40 mm and the adult microconch is about 15 mm. The shell morphology is acrioceratic to aspinoceratic (CASEY, 1960; AGUIRRE URRETA, 1986) with a spire that is proportionally important because it represents half of the height of the specimens.

In the most complete specimens it can be observed that the first ontogenetic stages of the shell morphology follow the typical aspinoceratic to acrioceratic development. The spiraled part of the shell constitutes the phragmocone. The shaft, which is very short, is more or less curved and links with a relatively opened crozier. The whorl section is elliptical.

Three successive ornamental stages can be observed:

- The first ontogenetic stage the embryonic whorl and the next non-sculptured uncoiled whorl are not known. On the preserved parts of the conical spiral there are very fine and numerous simple ribs that are regularly distributed. On all the samples the spire is not well preserved and, in consequence, difficult to describe;
- At the end of the spire and on the shaft the ornamentation consists of fine, very close and very numerous simple ribs with an angular section. Ribs are strongly prosiradiate on the peri-dorsal region of the shell, then they cross the sides, straight, before inclining more or less in the direction of the aperture in the most marginal part of the sides. Fairly regularly, groups of 2 to 4 ribs become slightly thicker with increasing

height. This characteristic is more visible due to the fact that these groups of ribs are often separated by an wider than usual interspace. This ornamentation style is the more distinctive character of this new taxon;

- On the hook and its return, the ribbing becomes more regular. It consists of simple, thicker and more or less spaced out ribs but on the beginning of the hook a few specimens show ribs fasciculated from the peridorsal region. Ribs are strongly inclined towards the aperture in the third lower portion of the sides, cross the flanks straight, before becoming noticeably thicker near the venter which they cross with their maximum thickness. We observe here and there rare bifurcations situated at different heights on the sides. On the return of the crozier and at the approach to the aperture, the ribs are even more widely spaced, stronger, especially in the third upper portion of the sides. On some specimens they incline rather strongly forward in the third upper portion of the sides.

Sutures lines cannot be studied.

No tubercles have been observed on any of the preserved parts.

Remarks, comparisons: *Xerticeras salasi* gen. nov. sp. nov. shows some variability affecting the strength of ribbing. We can observe the existence of forms with a little more regular and finer ribbing in which the groups of ribs arranged in ridges are slightly marked or almost non-existent whereas they are well marked in specimens showing a relative irregularity in the thickness of the ribs. The studied population also shows the presence of a small number of specimens characterized by their smaller size, about 15 mm high. The lack of forms of intermediate size leads us to consider these forms as possible microconchs.

With its very small size and shell morphology, *Xerticeras salasi* gen. nov. sp. nov. is close to *Volgoceratoides schilovkensis* BARABOSHKIN & MIKHAILOVA, 2002, but that species, described from the Volga River, shows bituberculated and unituberculate ribs on the shaft and regularly bifurcated ribs on the hook. Furthermore, on the returning part of the hook, the ribbing is simple. *Volgoceratoides schilovkensis* BARABOSHKIN & MIKHAILOVA, 2002, is known from the *Deshayesites volgensis* Zone of the Volga River Basin and from the *Deshayesites forbesi* Zone of Bulgaria (BARABOSHKIN & MIKHAILOVA, 2002; IVANOV & IDAKIEVA, 2013).

Occurrence: *Xerticeras salasi* gen. nov. sp. nov. is only known from the *Deshayesites deshayesi* and *Dufrenoya furcata* zones of Eastern Iberian Chain, Eastern Spain.

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► Plate 1:

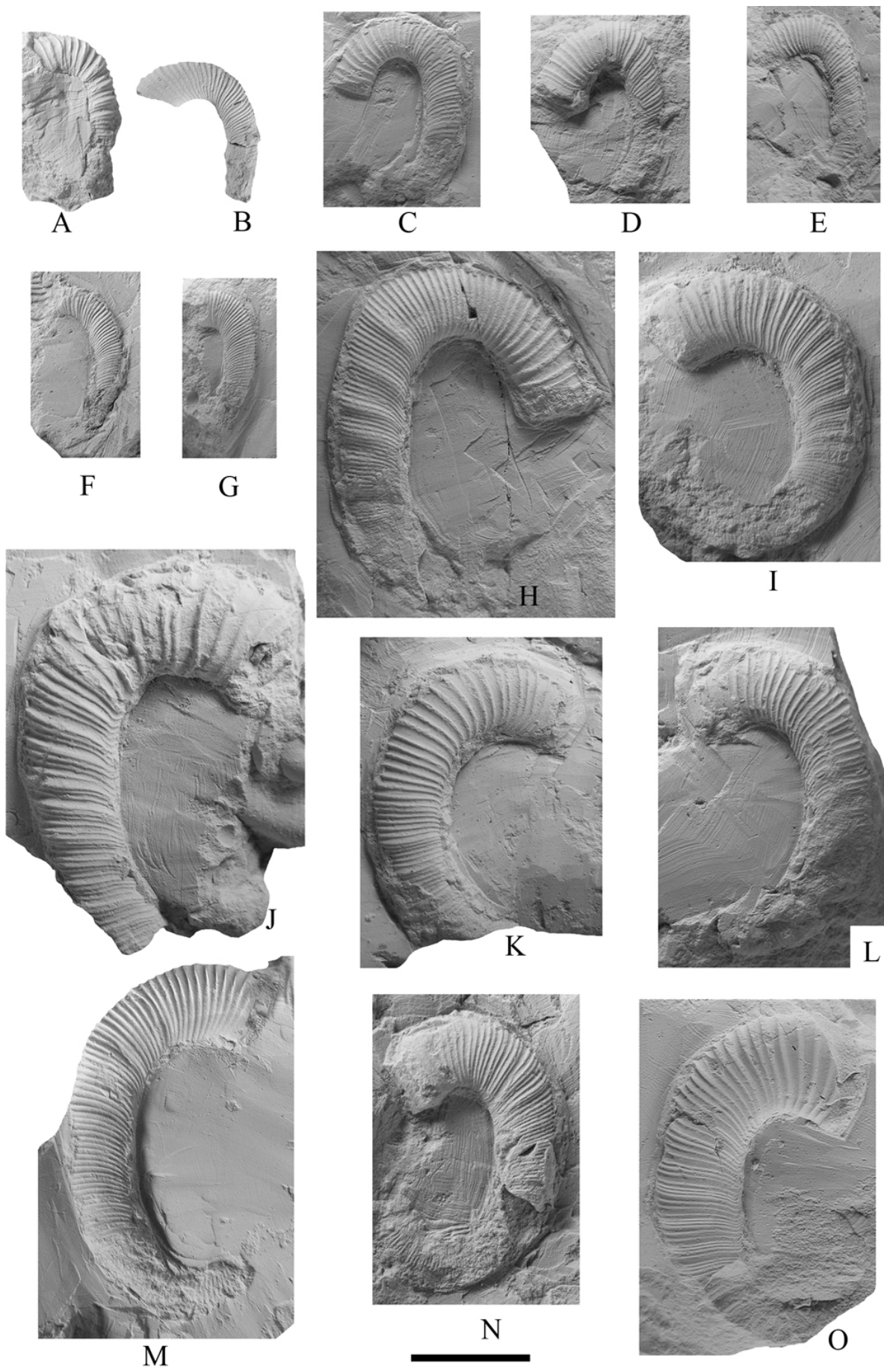
A-G: *Xerticeras salasi* gen. nov. sp. nov. microconch

A - lateral view of the specimen PUAB 88802, bed number MMSa 4. B - lateral view of the specimen PUAB 88814, bed number MMSa 4. C - lateral view of the specimen PUAB 88837, bed number MMSa 4. D - lateral view of the specimen PUAB 88838, bed number MMSa 4. E - lateral view of the specimen PUAB 88845, bed number MMSa 4. F - lateral view of the specimen PUAB 88846, bed number MMSa 4. G - lateral view of the specimen PUAB 88897, bed number MMSa 5a.

H-O: *Xerticeras salasi* gen. nov. sp. nov. macroconch

H - lateral view of the specimen PUAB 88835, bed number MMSa 4. I - lateral view of the holotype, the specimen PUAB 88836, bed number MMSa 4. J - lateral view of the specimen PUAB 88842, bed number MMSa 4. K - lateral view of the specimen PUAB 88840, bed number MMSa 4. L - lateral view of the specimen PUAB 88844, bed number MMSa 4. M - lateral view of the specimen PUAB 88891, bed number MMSa 5A. N - lateral view of the specimen PUAB 88890, bed number MMSa 4. O - lateral view of the specimen PUAB 88894, bed number MMSa 5A.

Scale bar 1 cm.



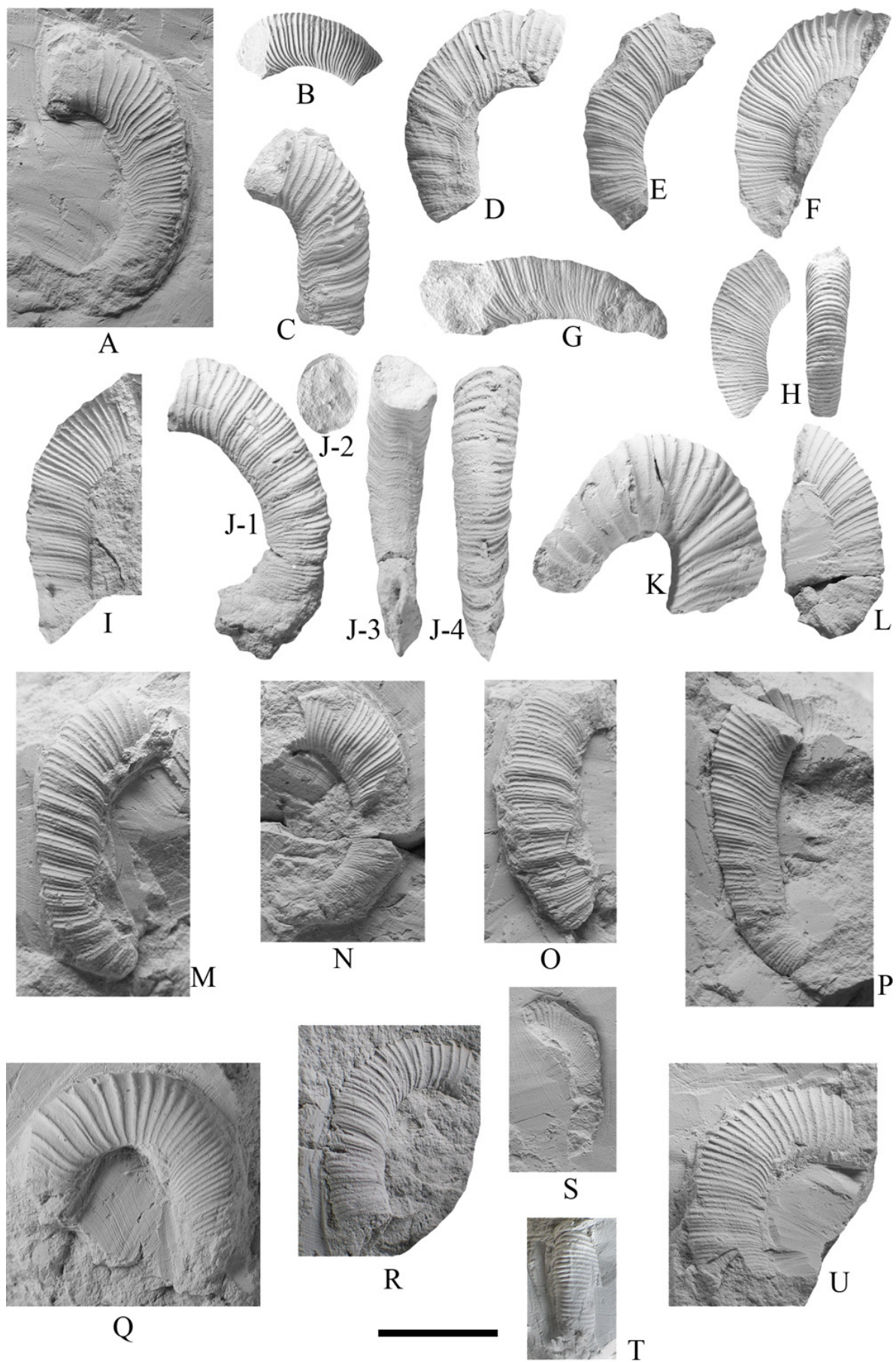
► **Plate 2:**

A-R, T-U: *Xerticeras salasi* gen. nov. sp. nov. macroconch

A - lateral view of the specimen PUAB 88960, bed number MRSa 3. B - lateral view of the specimen PUAB 88801, bed number MMSa 4. C - lateral view of the specimen PUAB 88803, bed number MMSa 4. D - lateral view of the specimen PUAB 88804, bed number MMSa 4. E - lateral view of the specimen PUAB 88805, bed number MMSa 4. F - lateral view of the specimen PUAB 88806, bed number MMSa 4. G - lateral view of the specimen PUAB 88807, bed number MMSa 4. H - lateral view of the specimen PUAB 88818, bed number MMSa 4. I - lateral view of the specimen PUAB 88809, bed number MMSa 4. J - 1 lateral, 2 whorl section, 3 adoral and 4 ventral views of the specimen PUAB 88810, bed number MMSa 4. K - lateral view of the specimen PUAB 88819, bed number MMSa 4. L - lateral view of the specimen PUAB 88820, bed number MMSa 4. M - lateral view of the specimen PUAB 88839, bed number MMSa 4. N - lateral view of the specimen PUAB 88843, bed number MMSa 4. O - lateral view of the specimen PUAB 88848, bed number MMSa 4. P - lateral view of the specimen PUAB 88850, bed number MMSa 4. Q - lateral view of the specimen PUAB 88855, bed number MMSa 4. R - lateral view of the specimen PUAB 88892, bed number MMSa 5A. T - lateral view of the specimen PUAB 88904, bed number MMSa 5A. U - lateral view of the specimen PUAB 88898, bed number MMSa 5A.

S: *Xerticeras salasi* microconch, lateral view of the specimen PUAB 88896, bed number MMSa 5A.

Scale bar 1 cm.



► **Plate 3:**

A-N, R: *Xerticeras salasi* gen. nov. sp. nov. macroconch

A - lateral view of the specimen PUAB 89044, bed number MMSa 4. B - lateral view of the specimen PUAB 88900, bed number MMSa 5A. C - lateral view of the specimen PUAB 88894, bed number MMSa 6. D - lateral and ventral views of the specimen PUAB 88899, bed number MMSa 6. E - lateral view of the specimen PUAB 88913, bed number MMSa 6. F - lateral view of the specimen PUAB 88929, bed number MMSa 6. G - lateral and ventral views of the specimen PUAB 89006, bed number MMSa 6. H - lateral view of the specimen PUAB 88947, bed number MRSa 3. I - lateral view of the specimen PUAB 88945, bed number MRSa 3. J - lateral and ventral views of the specimen PUAB 88949, bed number MRSa 3. K - lateral view of the specimen PUAB 88961, bed number MRSa 3. L - lateral view of the specimen PUAB 88962, bed number MRSa 3. M - lateral view of the specimen PUAB 88966, bed number MRSa 3. N - lateral view of the specimen PUAB 88967, bed number MRSa 3. R - lateral view of the specimen PUAB 88980, bed number MRSa 3.

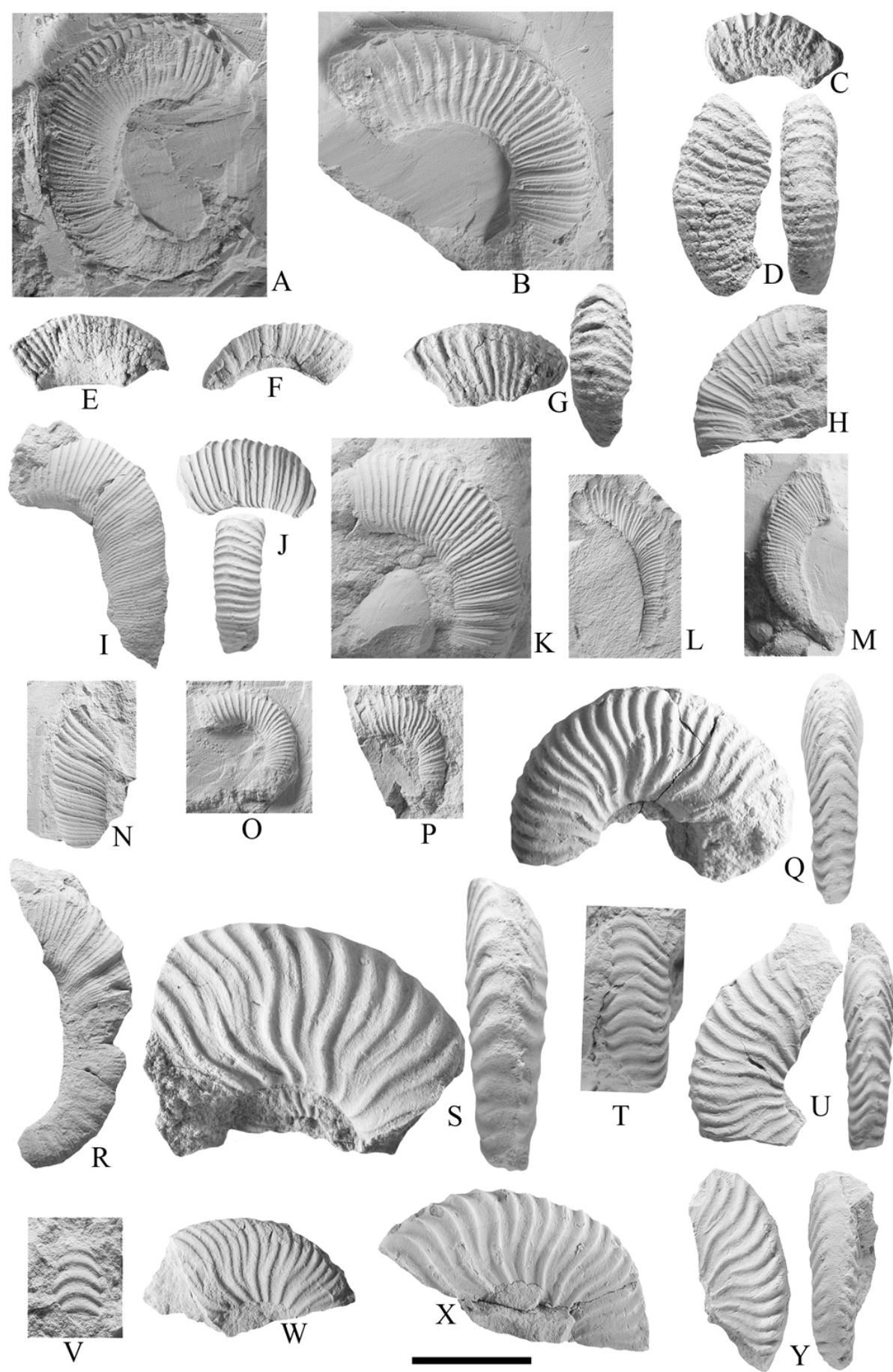
O-P: *Xerticeras salasi* gen. nov. sp. nov. microconch

O - lateral view of the specimen PUAB 88972, bed number MRSa 3. P - lateral view of the specimen PUAB 88976, bed number MRSa 3.

Q, S-Y: *Deshayesites deshayesi* (d'ORBIGNY, 1841)

Q - lateral and ventral views of the specimen PUAB 88823, bed number MMSa 4. S - lateral and ventral views of the specimen PUAB 88824, bed number MMSa 4. T - ventral view of the specimen PUAB 88874, bed number MMSa 4. U - lateral and ventral views of the specimen PUAB 88881, bed number MMSa 5. V - ventral view of the specimen PUAB 88877, bed number MMSa 5. W - lateral view of the specimen PUAB 88879, bed number MMSa 5. X - lateral view of the specimen PUAB 88885, bed number MMSa 5. Y - lateral and ventral views of the specimen PUAB 88884, bed number MMSa 5.

Scale bar 1 cm.



► **Plate 4:**

A-B, D-E, G-L, O: *Deshayesites deshayesi* (d'ORBIGNY, 1841)

A - lateral view of the specimen PUAB 88876, bed number MMSa 5. B - lateral view of the specimen PUAB 88886, bed number MMSa 5A. D - lateral and ventral views of the specimen PUAB 88936, bed number MRSa 2. E - lateral view of the specimen PUAB 88887, bed number MMSa 5A. G - lateral view of the specimen PUAB 88937, bed number MRSa 2. H - lateral view of the specimen PUAB 88981, bed number MRSa 3. I - lateral view of the specimen PUAB 88943, bed number MRSa 2. J - lateral and ventral views of the specimen PUAB 88952, bed number MRSa 3. K - lateral and ventral views of the specimen PUAB 88956, bed number MRSa 3. L - lateral and ventral views of the specimen PUAB 88984, bed number MRSa 3. O - lateral view of the specimen PUAB 88986, bed number MRSa 3.

C, F: *Dufrenoyia furcata* (J. de C. SOWERBY, 1836)

C - lateral and ventral views of the specimen PUAB 88934, bed number MMSa 6. F - lateral and ventral views of the specimen PUAB 89010, bed number MMSa 6.

M: *Pseudohaploceras* sp., lateral view of the specimen PUAB 88828, bed number MMSa 4.

N: *Pseudosaynella* sp., lateral view of the specimen PUAB 88889, bed number MMSa 5A.

P, R: *Toxoceratoides royerianus* (d'ORBIGNY, 1841)

P - lateral view of the specimen PUAB 89014, bed number MMSa 6. R - lateral view of the specimen PUAB 88958, bed number MMSa 3.

Q, S: *Chelonicerias* sp.

Q - ventral view of the specimen PUAB 88870, bed number MMSa 4. S - ventral view of the specimen PUAB 89016, bed number MMSa 6.

Scale bar 1 cm.

