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On the ammonite fauna of the Lithographic Limestones from the Zapala region (Neuquén province, Argentina), with the description of a new genus

By H. LEANZA, Buenos Aires, and A. ZEISS, Erlangen

With 3 figures in the text

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Abstract: A short review is given on the results of the most recent research work on the ammonites of the Upper Jurassic Lithographic Limestones from Zapala. The sections have been recollected and as far as possible surveyed in more detail. - Around 200 ammonites have been studied taxonomically. We could observe 11 genera and 19 species belonging to 4 families and 3 subfamilies; 3 genera, 1 subgenus and 11 species are new. The new genus *Catutosphinctes* is here described. Besides, it was possible to improve the stratigraphic subdivision by introducing two subzones and two faunal horizons within the *Windhauseniceras internispinosum* Zone.

Zusammenfassung: Ein kurzer Überblick über die neuesten Forschungsergebnisse an den oberjurassischen Ammoniten-Faunen der Plattenkalke von Zapala wird vorgelegt. Die Fundstellen wurden nochmals begangen und neue Aufsammlungen vorgenommen. Ungefähr 200 Ammoniten standen für die taxonomischen Untersuchungen zur Verfügung. Es konnten 11 Gattungen und 19 Arten festgestellt werden, davon sind 3 Gattungen, 1 Untergattung und 11 Arten neu; sie gehören zu 4 Familien und 3 Unter-Familien. Die neue Gattung *Catutosphinctes* wird hier beschrieben. Die stratigraphische Untergliederung konnte verbessert werden: Die Zone des *Windhauseniceras internispinosum*, während der die Plattenkalke zur Ablagerung kamen, konnte erstmals in zwei Subzonen unterteilt werden. Die obere Subzone läßt sich weiter in zwei Faunenhorizonte unterteilen.

Resumen: Presentamos un cuadro sinóptico sobre los resultados más recientes de nuestras investigaciones acerca de los amonites de las calizas litográficas de la región de Zapala en Argentina. Examinamos de nuevo las localidades de los hallazgos y realizamos nuevas colecciones. El resultado de nuestros estudios de los 200 ejemplares de amonites ahora exis-

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tentes es el siguiente: En el material investigado comprobamos 11 géneros y 19 especies; 3 géneros, 1 subgénero y 11 especies son nuevos. Pertenecen a 4 familias y 3 subfamilias. El nuevo género *Catutosphinctes* es aquí descripto. La subdivisión de la columna se pudo mejorar. La zona de *Windhauseniceras internispinosum*, durante de la cual las calizas litográficas se depositaron, pudo ser subdividida por primera vez en dos subzonas.

A. Introduction

In 1983 a joint Argentinian-German research project on the recently discovered marine "Plattenkalke" of Upper Jurassic age in the province of Neuquén (Argentina) had been proposed; first research steps in the field could be executed in 1986.

Reports about these earlier activities an their first results were published by CIONE et al. (1987) and by LEANZA & ZEISS (1990). - In addition to the research work mentioned in these papers also a palynological investigation on dinoflagellates is now being undertaken by our colleagues W. VOLKHEIMER and M. QUATTROCHIO.

The authors' contributions to the joint research project were to concentrate mainly on the clarification of the local geology and on a study of the ammonite fauna. For this, a longer stay of both authors in Zapala was necessary. Finally, during a sabbatical half-year of one of the authors (A. Z.) the planned studies could be undertaken in the winter season 1989/90.

During our stay in 1986 we collected a lot of ammonites in the Lithographic Limestone quarries, NW of Zapala. They were stored at the local "Museo Prof. Dr. J. Olsacher". During the northern winter 1989/90 the studies could be continued with more time available. Our program was concentrated on a taxonomical study of all ammonites. As the material was too fragile for transport, we had to carry out our research work in Zapala.

We had planned to undertake some additional field work, especially in the beginning. As far as a car was available in the difficult economic situation of the country, we used those rare days for additional collecting of ammonites. We were successful in obtaining more material from the levels x+a and x, in which we could not collect much material in 1986. Also level y provided us with some new material, while additional material of level w we found at a new locality near Pichi Moncol. Smaller collections were undertaken during the reconnaissance work at further out-

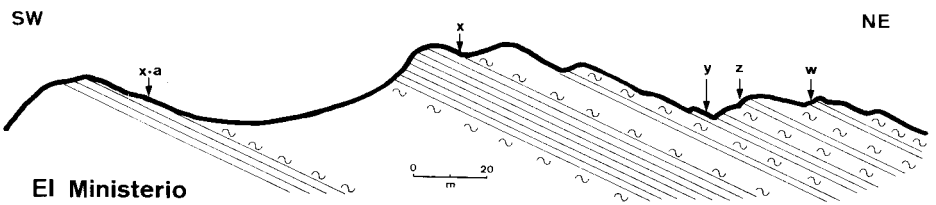

Fig. 1. A cross-section at El Ministerio quarry area traced out by composite sections and supplements.

crops at El Pozo, Loma Negra, and Los Alazanes quarries. - Beside the collecting of new ammonite material, we tried to clarify the succession at "El Ministerio" in more detail by surveying a detailed cross-section (cf. Fig. 1). - As far as time was available, we took also some samples for thin slide studies and for geochemical analysis. The studies on these materials have not been finished yet; primary results led to recognize in the dark lenticles of level x an amount of more than 1.38 % organic material. In the thin sections in all five levels a biomicrite (mudstone, wackestone, packstone) with a varying amount of silty eolic material (1-2 %), biogene components (10-30 %, max. 50 %) consisting mainly of forams, molluscan and echinoderm fragments, sponge spicules, and radiolarians could be recognized; varying (small) amounts of some minerals, like quartz (1-2 %), calcite, chlorite, muscovite, zircon; pyrite (0-7 %) and collophane (0-3 %) were also to be observed.

During our stay in Zapala we had the opportunity to meet colleagues working in the oil industry; they presented us their most recent results on the paleogeography; interesting for the possible origin of the terrestrial components of the sediments and the fauna is the assumption of an island around 40 km southeast of Zapala in the Upper Tithonian (LEGARRETA & ULIANA 1991, Tab. 7).

B. Taxonomic overview on the studied material

Altogether our collecting activities resulted in further 50 specimens of ammonites; thus, the whole material to be studied in three weeks consisted of about 200 specimens. Some other specimens of the museum collected at the famous, partially time-equivalent locality of Cerro Lotena, 70 km SE from Zapala, were included in our studies; they are mostly better preserved and thus offered valuable supplementary information.

a) Basis data: The number of studied specimens coming from the following levels:

x+a	x	y	z	w
20	57	49	11	57

b) Taxonomic overview (first position: number of genera, second position: number of species):

x+a	x	y	z	w
2/2	2/2	7/12	2/5	8/13

c) Results: Altogether this material consists of 3 families, 4 subfamilies, 11 genera and 19 species; 1 subfamily, 3 genera, 1 subgenus and 11 species are new; of these new taxa one genus (*Zapalia*) and two species (*fascipartita* and *catutosense*) were described very recently by LEANZA & ZEISS (1990).

The number of specimens per species (in brackets) and their distribution in the different levels is given in the following list (abbreviations of genera see at the end of the compilation):

x+a	x	y	z	w
PERISPHINCTIDAE				
Au. proximus (16)				
Corong. sp. (4)		*Corong.* sp. (1)		
	Windhaus. internisp. (2)	*Windhaus. internisp.* (2)		*Windhaus. internisp.* (3)
		Windhaus. n. sp. A (1)		*Windhaus.* n. sp. A (1)
	Ca. rafaeli (55)			
		Ca. n. sp. A (5)		*Ca.* n. sp. A (1)
		Z. fascipart. (10)		*Z. fascipart.* (5)
		Z. sp. n. A (8)	*Z.* sp. n. A (4)	*Z.* sp. n. A (8)
		Z. sp. n. B (1)	*Z.* sp. n. B (1)	*Z.* sp. n. B (1)
		Z. sp. n. C (4)	*Z.* sp. n. C (4)	*Z.* sp. n. C (15)
			Z. sp. n. D (1)	*Z.* sp. n. D (4)
		Z. (s. l.) sp. n. A (1)		
		Z. (s. l.) sp. n. B (3)		*Z.* (s. l.) sp. n. B (8)
			Gen. n. sp. n. (3)	Gen. n. sp. n. (4)
				Djurjuric. catutosense (1)
ASPIDOCERATIDAE				
		Aspidoc. altum (9)	*Aspidoc. altum* (1)	*Aspidoc. altum* (4)
				Simoceras sp. (2)
OPPELIIDAE				
		Oppeliidae sp. (2)		

(Abbreviations of generic and specific names: *Aspidoc.* = *Aspidoceras*, *Au.* = *Aulacosphinctes*, *Ca.* = *Catutosphinctes*, *Corong.* = *Corongoceras*, *Djurjuric.* = *Djurjuriceras*, *Windhaus.* = *Windhauseniceras*, *Z.* = *Zapalia*, *fascipart.* = *fascipartita*, *internisp.* = *internispinosum*)

With one exception (*Catutosphinctes rafaeli*) the new taxa will be mentioned in this paper only on open nomenclature; a complete monographic study with all new taxonomic results will be published elsewhere.

C. Biostratigraphic results (cf. Fig. 2)

On the basis of the taxonomic studies, the ammonites provided the possibility of carrying out a subdivision of the Zone of *Windhauseniceras internispinosum*, which was not possible until now. Of course, further comparative studies are necessary to find out, if the subdivision presented below can be applied to other localities and if it is of regional importance. The units used here are those of biostratigraphic rank.

1. Zone of *Windhauseniceras internispinosum*

1.1. Subzone of *Zapalia fascipartita*
1.1.1. Faunal horizon of *Djurjuriceras catutosense* (level w)
1.1.2 Faunal horizon of *Aspidoceras altum* (level y and z)

1.2. Subzone of *Catutosphinctes rafaeli* n. gen. n. sp. (level x)

In the lower part of the section El Ministerio the level x+a could be attributed definitely to the Zone of *Aulacosphinctes proximus*. Thus, the boundary between this zone and the Zone of *Windhauseniceras internispinosum* lies somewhat higher than we had supposed earlier (cf. LEANZA & ZEISS 1990), i. e. between level x+a and x.

D. Phylogenetic and zoogeographic aspects

The investigations on the perisphinctids have not been finished as far as these aspects are concerned. We suppose that there was after the *Pseudolissoceras zitteli* Zone a new immigration of perisphinctids in the *Aulacosphinctes proximus* Zone from the main sea; they developed in different directions. As the inner whorls of *Catutosphinctes* show a certain resemblance to those of *Windhauseniceras*, certain *"Subdichotomoceras"* and *"Aulacosphinctoides"* of the *Internispinosum* Zone, a common origin in the group of *Aulacosphinctes proximus* may be presumed. Also the other two new genera as well as the already described genus *Zapalia* (with two subgenera) and the Argentinian *Djurjuriceras* seem to belong to the same phylogenetic stock; they represent an eastern-Pacific offshoot of perisphinctids - a parallel development to the subfamily Paraulacosphinctinae (s. l.) in Europe -, which constitutes in our opinion an own subfamily ("Windhauseniceratinae").

E. Comparisons with Solnhofen

After considering all new observations we have come to the conclusion that it is better to wait with a detailed comparison between the Solnhofen and Zapala Lithographic Limestones until the taxonomic studies are finished and a comparison with the normal facies of adjacent areas

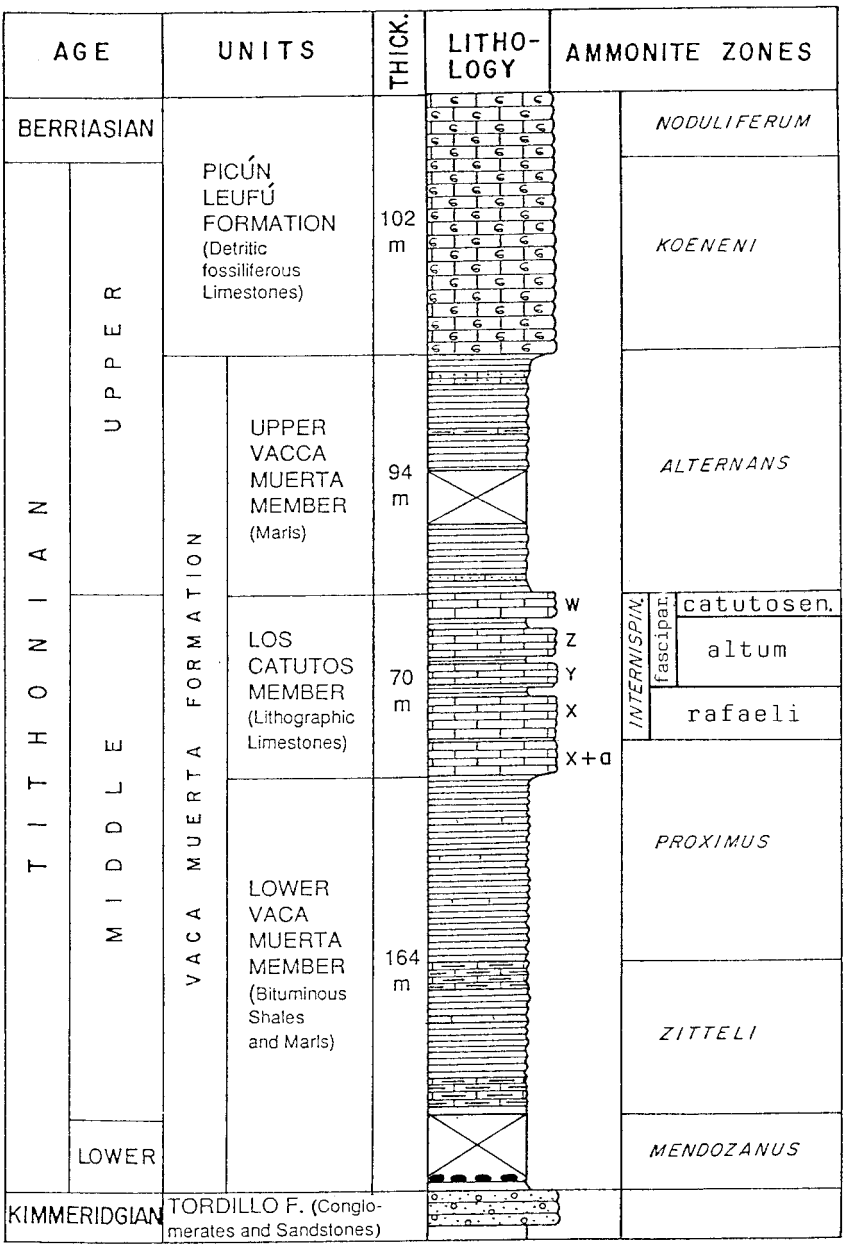

Fig. 2. Biostratigraphic subdivision of the Upper Jurassic of the Neuquén Basin with revision and subdivision of the *Windhauseniceras internispinosum* Zone on the basis of the new results of this paper.

will be executed. Also a thorough study of the thin sections and further geochemical analyses will be necessary.

F. Systematic description

Observing that the level x is characterized by an association of very rare *Wi. internispinosum* with an assemblage of numerous, but rather variable forms of one single undescribed species, we think it useful to describe this form shortly so that it can be used as a valid subzonal index. A full description of all varieties of this new species will be published later.

Order Ammonoidea ZITTEL, 1884
Suborder Ammonitina HYATT, 1889
Superfamily Perisphinctaceae STEINMANN, 1880
Family Perisphinctidae STEINMANN, 1890
Catutosphinctes nov. gen.

Type species: *Catutosphinctes rafaeli* n. sp.

Etymology: After the Indian village Los Catutos, 13 km NW from Zapala, Argentina.

Further species: *Catutosphinctes* sp. n. A and *Catutosphinctes* sp. n. B (to be described later) from Zapala and Cerro Lotena, *C. americanensis* LEANZA sp. (originally described as *"Pachysphinctes"*) from Cerro Lotena.

Diagnosis: Dimorphic species of medium size, evolute. Macroconchs with four stages of ribbing: (1) inner whorls with single and biplicate ribs. On outer whorl transition to (2) with bifurcate ribs alternating with trifurcate or intercalatory ribs, followed by a constriction, then (3) with distant primaries and secondaries either bifurcate or polygyrate, often irregularly splitting. (4) After a constriction distant bifurcate, projected ribs or collar ribs or irregularly arranged prominent ribs with intercalatories. - Microconchs smaller, mainly bifurcate, single ribs or trifurcate ribs may be present, but without stadium 3 and 4.

Remarks: The inner whorls of the type species of the genus *Windhauseniceras* A. F. LEANZA are reminiscent of the inner whorls of our new genus *Catutosphinctes,* but the former displays later on an entirely different ornamentation on the figured last whorl (cf. KRANTZ 1928: Pl. 2, Fig. 3a-b). However, it should be mentioned that the body chamber is not present in this "type specimen". Therefore no complete comparison can be made with the macroconchs of this genus. A complete microconch is figured by H. LEANZA (1980: Lám. 9, Fig. 1a-b). Other specimens like *W.* n. sp. A and *W. humphreyi* show that outer whorls are very regularly ribbed and therefore different from *Catutosphinctes.* - A further species is also included in *Catutosphinctes,* which has originally been described as *"Pachysphinctes americanensis"* by LEANZA (1980: p. 41, pl. 7, fig. 1), but the similarity to this genus is only superficial; the strong single collar ribs at the end of the last whorl are not present in *Pachysphinctes.* This stadium is not presented in any of the Los Catutos specimens, and therefore seems to document a further development in beds at Cerro Lotena somewhat younger than levels x and y.

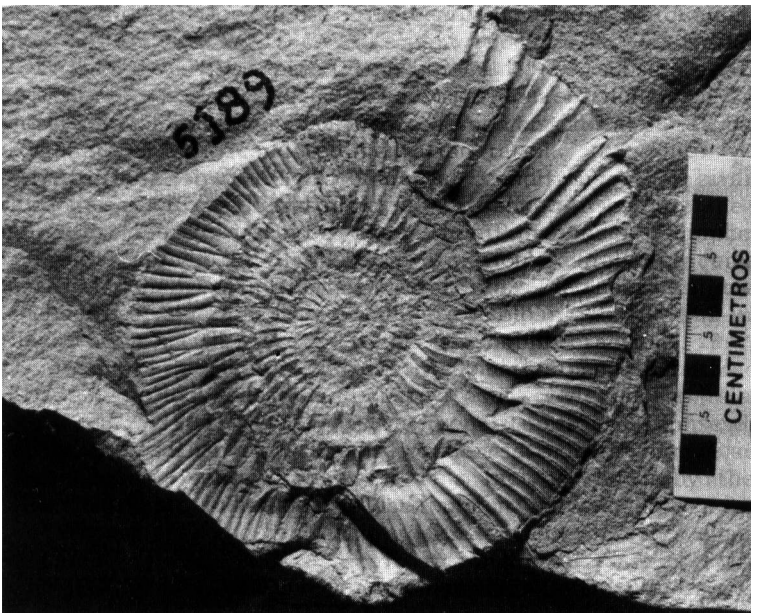

Fig. 3. *Catutosphinctes rafaeli* n. gen. et n. sp., holotype, Museo Olsacher, Zapala, no. 5189, level x, El Ministerio, NW of Zapala, Neuquén Province, Argentina.

As the inner whorls of *Catutosphinctes* show a certain resemblance to those of *Windhauseniceras*, certain *"Subdichotomoceras"* and *"Aulacosphinctoides"* of the *Internispinosum* Zone, a common origin may be presumed. Also the other two new genera as well as the already described genus *Zapalia* (with two subgenera) and the Argentinian *Djurjuriceras* seem to belong to the same phylogenetic stock; they represent an eastern-Pacific offshoot of perisphinctids - a parallel development to the subfamily Paraulacosphinctinae (s. l.) in Europe, which constitutes in our opinion an own subfamily ("Windhauseniceratinae").

Catutosphinctes rafaeli n. sp.
(Fig. 3 and cover)

H o l o t y p e : Museo Olsacher, Zapala, no. 5189.

P a r a t y p e s : Museo Olsacher, Zapala, no. 5192 and 3766 as well as 53 additional specimens to be described monographically later on.

E t y m o l o g y : This species is dedicated to RAFAEL COCCA (Zapala).

D i a g n o s i s : Dimorphic species, medium size, rather variable. Macroconchs with four ribbing stages during ontogenetic development as described in diagnosis of genus; some varieties are characterized by minor deviations in regularity and density of ribbing. Microconchs only with two stages.

Description of holotype and similar specimens: Inner whorls with sharp single ribs, recticostate, bifurcating point just below the next whorl, often somewhat thickened like in *Windhauseniceras*. These very small thickenings are no more observable on the last whorl, where the ribs split up on the midth of the flank into two or three secondaries. Mostly after a constriction stage 3 follows with distant, somewhat thickened primaries. The arrangement of the bi- or trifurcating secondaries becomes irregular; frequently intercalatories appear. After a further constriction, marked by strong single ribs, stage 4 follows with distant biplicate ribs; the point of bifurcation is situated rather deep at one third of the whorl height. Intercalatories may be present, as well as further constrictions and double collar ribs; they are often curved in advance or somewhat sinuous. The margin of the aperture is simple.

The length of the body chamber was about three quarters of the last whorl. Suture lines cannot be observed.

Microconchs corresponding tentatively to the holotype and similar forms are rather densely ribbed on inner whorls; there are sharp bifurcating and single ribs. The point of bifurcation lies rather high on the inner whorls (3/4 of WH), while it is lower on the outer whorl (2/3 or 1/2 of WH). Constrictions are not well developed; only at the outer margin of the last whorl of one specimen one prosocostate is recognizable. - Another form displays a small ear at the margin of the aperture.

Measurements:

DM	WH	WB	NW	IR	AR
5189 (Ma., holotype)					
150	45 (0.30)	-	68 (0.45)	20	45
5192 (Ma., paratype)					
140	46 (0.33)	-	39 (0.49)	29	50
3766 (Mi., paratype)					
77	20 (0.26)	-	35 (0.45)	31	55

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Addresses of the authors:

Dr. H. LEANZA, Secretaría de Minería, Av. Santa Fé 1548, 1060 Buer Aires, Argentina.

Prof. Dr. A. ZEISS, Paläontologisches Institut der Universität, Loewenic straße 28, D-8520 Erlangen.