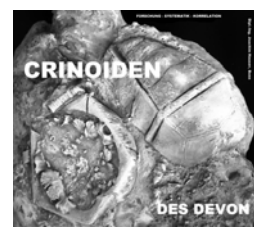


***Alejecrinus doyagueae* n.gen. et n.sp. (Crinoidea, Inadunata)
from the Santa Lucía Formation of the Cantabrian Mountains
(Province León, northern Spain)**

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1 Introduction (by Fernando Gómez LANDETA)

The river Esla valley in the NE corner of the León province in Northern Spain, shows sections of Devonian that given its completeness, variety, facility of access and clear outcrop, can be classified as the better ones for this period in Europe. In general its faunas are almost identical to those found in other parts of the Cantabrian zone and incorporated in its studies accordingly. With respect to crinoids the only work done with specimens of the area is the seminal study of BREIMER, 1962, this author classified two new species *Cantharocrinus simplex* and *Oenochoacrinus scaber* coming from here. After BREIMER, there were no more contributions, so it is a great pleasure for us fifty years afterwards to add the description of a new genera to the crinoidal bibliography of this outstanding area.

2 Geology and Age (by Fernando Gómez LANDETA)

The new genera was found at forty meters of the top of Santa Lucía Formation. Along with it there were collected: one specimen of the blastoid *Cordyloloblastus* aff. *C. alejensis*, the brachiopods *Uncinulus orbignanus*, and *Schizophoria hipponix*, as well unidentified stems of crinoids, corals and bryozoans. This fauna is typical of upper member of Santa Lucía, levels 16-17 of GARCIA-ALCALDE, 1996, in the transition of Lower-Middle Devonian and must also roughly corresponds with level Crinoid-3 of BREIMER, 1962: 175, text-fig. 40 although none of the crinoids of this level were found. The exact transition was determined by the magneto-stratigraphic technique by ELLWOOD et al., 1996, in the El Puerto creek section, 45 km. to the W of Aleje outcrop, as lying at sixty meters under the top of the formation. Given that in the two sections Santa Lucía Formation have roughly the same thickness, (240-250 m.), and the total identity of facies between both sections, the new taxon, at forty meters of the top as stated, must correspond in age to the base of Eifelian.

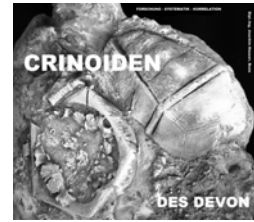
Chronostratigraphy			Region										
			Asturias	León									
Upper Devonian	Famennian	Upper	Eremita	Eremita									
		Middle	?	?									
		Lower		Fueyo									
	Frasnian	Pineres	Conglomerate Crémenes	Nocedo									
Middle Devonian	Givetian		Candás	Valdoré									
				Portilla									
	Eifelian		Naranco	Hurgas									
			Moniello	Santa Lucía									
Lower Devonian	Emsian	Upper	Aguión	Coladilla									
		Lower	La Ladróna	Valporquero									
	Pragian		Bañugues	La Pedrosa									
				Felmin									
	Lochkovian	Upper	Nieva	Nieva									
		Lower	Furada	San Pedro									
			<table border="1"> <tr> <td>4</td> <td rowspan="2">Esla</td> <td>Coladilla</td> </tr> <tr> <td>3</td> <td>Valporquero</td> </tr> <tr> <td>2</td> <td rowspan="2">Abelgas</td> <td>La Pedrosa</td> </tr> <tr> <td>1</td> <td>Nieva</td> </tr> </table>	4	Esla	Coladilla	3	Valporquero	2	Abelgas	La Pedrosa	1	Nieva
4	Esla	Coladilla											
3		Valporquero											
2	Abelgas	La Pedrosa											
1		Nieva											



↑ Text-Figure 1: Chronostratigraphy of the north-spanish Devonian (Asturias und León) after GARCIA-ALCALDE, J.L., CARLS, P., ALONSO, M.U.P., LÓPEZ, J.S., SOTO, F., TRUOLS-MASSONI, M. & VALENZUELA-RIOS, J.I. (2002): p. 69, fig. 6.2.; right photo shown the locus typicus of *Alejecrinus doyagueae* n.gen. et n. sp. near the hamlet of Aleje (Cantabrian Mountains, northern Spain) (the □ shown the exact outcrop in the profile)

Kurzfassung: Aus der Santa Lucía Formation nahe der Ortschaft Aleje (Kantabrischen Gebirge, Nordspanien) wird ein neues inadunates Taxon (*Alejecrinus* n.gen.) mit einer neuen Art (*Alejecrinus doyagueae* n.sp.) beschrieben. Diese Art als ein neuer Vertreter der *Sphaerocrinus-Paleocrinus*-Entwicklungslinie verfügte vermutlich über bewegliche Stacheln im Bereich der Basalia.

Abstract: A new inadunate crinoid-genus (*Alejecrinus* n.gen.) with one new taxon (*Alejecrinus doyagueae* n.sp.) is described from the Santa Lucía Formation (Middle Devonian) of the Aleje-Region (Cantabrian Mountains) of northern Spain. This genus with probably spines at the Basalia is a new representative of the *Sphaerocrinus-Palaeocrinus*-lineage.

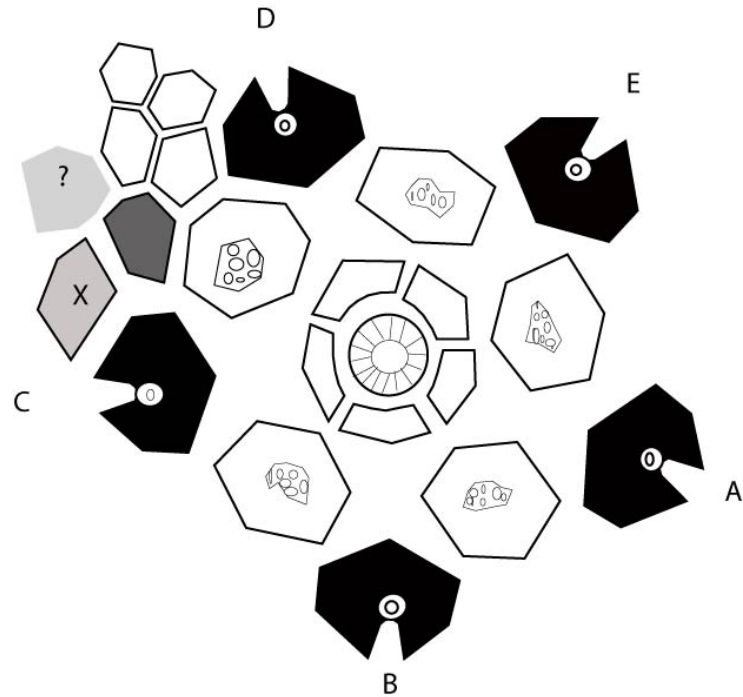


Resumen: Se describe un nuevo crinoideo inadunata, *Alejecrinus* n.sp. y una nueva especie, *Alejecrinus doyagueae* n.sp., procedente de la Formación Santa Lucía (Devónico inferior-medio), encontrado cerca del pueblo de Aleje, en el valle del río Esla, (León, N. de España). Este género, portando probablemente espinas en las basales, es un nuevo representante del linaje *Sphaerocrinus – Palaeocrinus*.

Schlüsselwörter: Crinoiden, Systematik, Inadunata, *Alejecrinus* n.gen, Kantabrisches Gebirge, Nordspanien, Santa Lucía Formation, Mittel-Devon

Key-Words: Crinoids, systematics, Inadunata, *Alejecrinus* n.gen, Cantabrian Mountains, northern Spain, Santa Lucía Formation, Middle Devonian

→ **Text-Figure 2:** Diagram of *Alejecrinus*; black = radialia, dark-grey = ?RA; medium-grey = anal X_1



3 Systematics (by Joachim HAUSER)

Classe Crinoidea J. S. MILLER, 1821
Sub-Classe Inadunata WACHSMUTH & SPRINGER, 1885
Order Cladida MOORE & LAUDON, 1943
Sub-Order Cyathocrinina BATHER, 1899
Super-Family Cyathocrinitacea BASSLER, 1938
Family Sphaerocrinidae JAEKEL, 1895
Genus *Alejecrinus* n.gen.

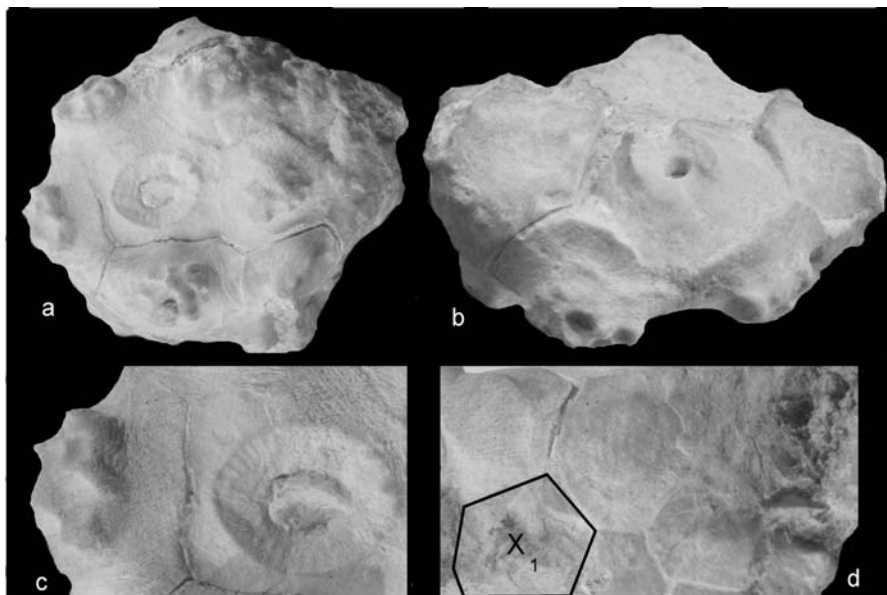
Derivatio nominis: The genus is named after the outcrop of the holotyp Aleje a small town in the León Province (Cantabrian Mountains of northern Spain).

Diagnosis of *Alejecrinus*: A dicyclic crinoid of the *Sphaerocrinus-Palaeocrinus*-lineage with five small flat infrabasal (incl. a round stem-facet), five convex basalia with hump-formed extension (probably with spines), five radialia with horse-shoe-formed arm-facets, and CD section with large primanal X_1 .

Type-species: *Alejecrinus doyagueae* n.sp.

Stratigraphical range Santa Lucía Formation, Middle Devonian

↓ **Text-Figures 3a—3d** = Holotyp of *Alejecrinus doyagueae* n.gen. et n.sp.; b = side-view of the holotyp; the photo show the structure of the convex radialia with the typical arm-facets of the *Sphaerocrinus-Palaeocrinus*-lineage; c = basalia with



hump-formed extension (probably the base of spines) and the flat infrabasal (including the large round stem-facet); d = CD-Intersection with primanal X_1

Derivatio nominis: The new species is named after its discoverer M^e ANGELES DOYAGUE, Palencia, northern Spain.

Holotyp: The specimen in text-fig. 3. The holotyp is stored (DPO 114229) in the Departamento de Paleontología de la Universidad de Oviedo (Asturias, España).

Locus typicus: Outcrop 300 m. to the E of the village of Aleje, Province León, Cantabrian Mountains, northern Spain.

Stratum typicum: Top of the Santa Lucía Formation, Lower Eifelian, Middle Devonian.

Material: Only the holotyp.

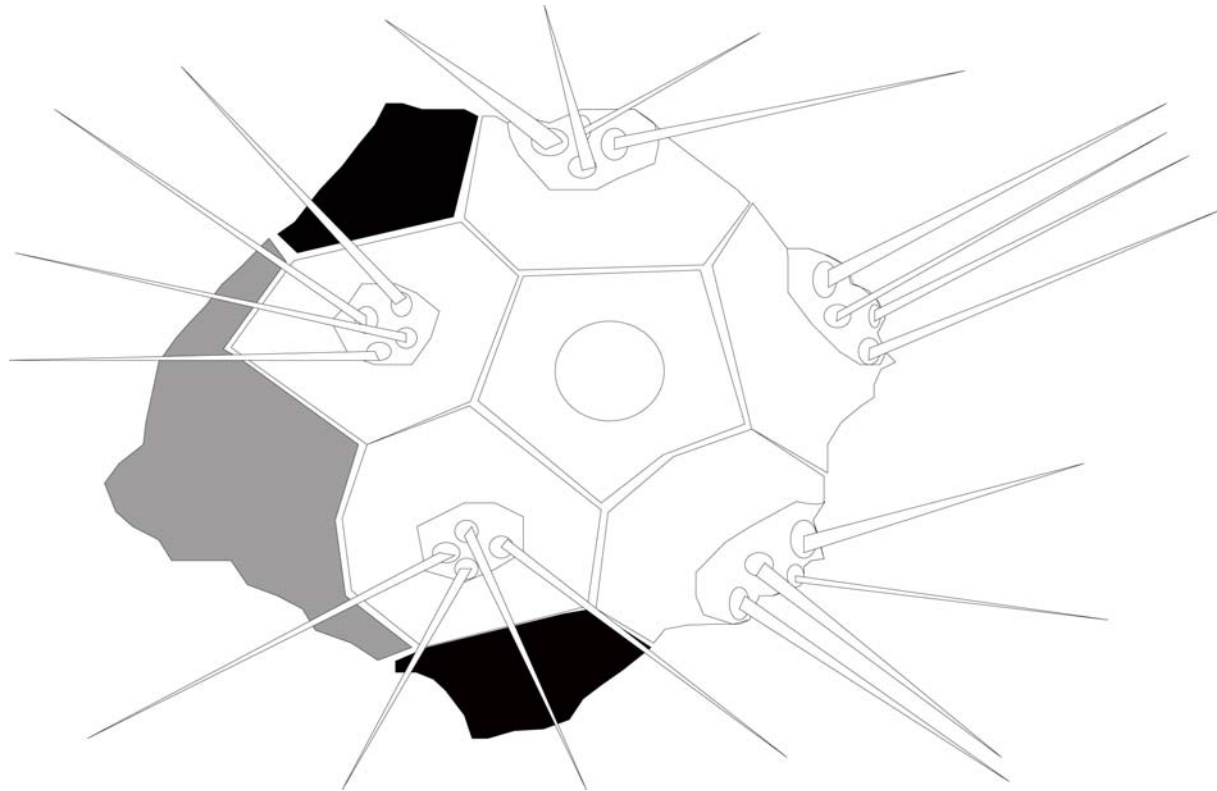
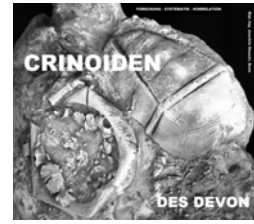
Diagnosis of *Alejecrinus doyagueae* (see diagnosis of the genus).

Description: A very unusual crinoid more than three times wider than high, small flat infrabasal (including a large round stem-facet), basalialia each with hump-formed extensions and convex radialia with the typical arm-facets of the *Sphaerocrinus-Palaeocrinus*-lineage (see text-figure 4).

→ **Text-Figure 4:** *Sphaerocrinus geometricus* (from the Middle Devonian of the Eifel-Hills) with the typical arm-facets like in *Alejecrinus doyagueae*

The CD-intersection shown (more or less covered) seven plates: one five-sided primanal X_1 in contact with six-sided ? RA and further three plates which are probably the base of a Proboscis.

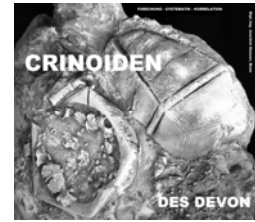
The function of the hump-formed extensions of the basalialia, each with up to five more or less round grooves is not resolved. But perhaps they are the basis of spines (see text-fig. 4) to protect the crinoid in a hostile environment.



↑**Text-Figure 5:** Drawn of the Holotyp of *Alejecrinus doyagueae* n.gen. et n.sp. with the probably arrangement of spines; black = radialia; grey: CD-section

Relations: The plate-arrangement, specially the structure of the radialia with the horse-shoe-formed arm-facets placed the new crinoid beyond question in the crinoid-family Sphaerocrinidae in a row with *Sphaerocrinus* and *Palaeocrinus*. *Alejecrinus doyagueae* differed from this species by the hump-formed extensions on the Basalia (probably with spines).

Dimensions: Hight = 10 mm, diameter_{max.} = 35 mm



Supplement-fauna (by Fernando Gómez LANDETA):

Some remarks about the presence of spines in the Cantabrian Devonian crinoids. Given the most striking character of the new genera it seems worth one rapid comment about what does tell us the presence or not of spines in the more than 77 species of Devonian crinoids known to date in the Cantabrian zone.

In the Lochkovian - Pragian of the north Spanish Devonian, there are no known crinoids with spines among the described. The character starts to appear in the Periechocriniids of the Upper Emsian: both *Stammocrinus* and *Pyxidocrinus* have but only in the tegmen, also *Trybliocrinus* who in juvenile specimens shows spines in the plates at the base of the cup afterwards overgrowth in adults. At the end of Emsian – base of Eifelian we found the acme of spinosity: Periechocriniids again, with *Babiocrinites* with spines who in the species *Babiocrinites costulatus* appear in cup and tegmen, same for *Pithocrinus spinosus*, the new *Alejecrinus* and *Acanthocrinus*, (known from isolated plates only). After a gap in the Eifelian with no known specimens, crinoids reappear in the Givetian with none with spines among them, this even for the still non described species of *Arthroacantha* affinity.

It can be speculated that the crinoids of this last stage are in general forms associated with the reef environment where the corals form niches walled enough to protect against depredators, this at variance with the conditions in the transition Lower-Middle Devonian where the crinoids lived in the open in the bottom of the shallow sea with at the most the doubt full company as protectors of bryozoans.

One of first theories about the function of spines in crinoids was advanced by SCHMIDT, 1938, who when studied the Lower Devonian fauna of Hunsrück Schiefer, postulated that the presence of them in genera as *Monstocrinus* or *Acanthocrinus* among others served the animal as one extra respiratory organ in the stagnate semi-euxinic environment. Afterwards the general consensus was that the spines of crinoids had the function of defense against predators as is the universal case in the vegetal and animals kingdoms. Who could be the predators in the case of crinoids? Among the most cited “suspects”, we have:

- **Gastropods Platyceratids:** The meaning of the known association of gastropods of the Platyceratid family with crinoids has intrigued from long ago the palaeontologist and different explanations had been offered, (see a resume in GHAN et al., 2003). We disagree with the interpretation of this authors of *Platyceras* as only parasites of crinoids. For us, as for WOOD, 1980, the relation between them was one of harmonious **co-adaptation**: the snail as coprophagous feeder, and the crinoid obtaining the advantage of the elimination of its excreta whose harmful effects as sticky dirt in the cilia can be deducted from the long anal pyramids that many genera developed.

As proof that *Platyceras* were not harmful to the crinoids we can mention that in our limited experience both *Pyxidocrinus* and *Stammocrinus* genera are clearly devoid of spines just in the sector of tegmen encircling their anal pyramids, to the contrary their proliferated in the rest of it, specially in the area next to the mouth aperture. This fact seems far from unusual, we can cite the case of *Arthroacantha carpenteri*, from Silica Shale Formation studied by BAUMILLER, 2002, as example of snail infestation. As stated by this author *A. carpenteri* has articulate spines in cup, tegmen and arms, anyway *Platyceras* fixed over its anal pyramid who means it had not spines, why this part, and only this, of the whole anatomy was devoid of spines? The answer seems clear: the snail was welcomed by the crinoid. The same can be said of *Gennaeocrinus variabilis*, cited by GHAN et al., 2003, again as a case of parasitism by *Platyceras*, and provided of spines in cup and tegmen. We believe that this kind of observation can be extended to many other spinose crinoids.

- **Orthoceratiids or other cephalopods:** Against them as predators we have the fact that the facies of cephalopods are usually incompatible with the ones of crinoids. In the Cantabrian area as in other crinoidal realms the finding of *Orthoceras* in crinoidal beds is purely anecdotal. Is also doubtful that the chitinous anaptychi that made the function of jaws in this group could be strong enough to crush the robust thecae of crinoids, some with plates 0,5 cm. thick.

- **Fishes:** They were for sure predators and their jaws in adult specimens strong enough to crush the prey, but their scarcity is against as too much effect in the crinoidal communities.

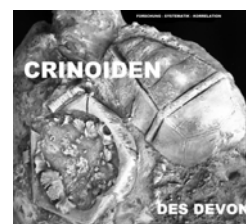
From this rapid comment of what tell us the character of “spinosity” in the crinoidal communities of the Cantabrian Devonian, we conclude stating that for us the predation in crinoids is a matter still not solved. With reserves it could be speculated that in fact and as in other groups of invertebrates (brachiopods, bivalves, etc), crinoids lacked in” broad terms” of predators in the Paleozoic period, and this given the flat status of the then biological pyramid. The stresses of the group would come from abiotic factors.

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