

About the finding of *Sphaerocrinus wolfgangschmidti* and *Situlacrinus costatus* at the Aguión Formation (Upper Emsian, Lower Devonian, Northern Spain) and systematical remarks of

***Cosmocrinus* JAEKEL, 1898 vs. *Costalocrinus* JAEKEL, 1918**

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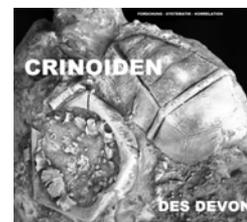
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Introduction

In old searches before the area of Arnao attained the status of protection a juvenil cup of *Sphaerocrinus wolfgangschmidti* and a cup in situ of the taxon *Situlacrinus costatus* BREIMER, 1962 were found. This is the occasion to study these crinoids again.

Abstract: Some stratigraphical and systematical aspects of the taxon *Sphaerocrinus wolfgangschmidti* HAUSER & LANDETA, 2007 und *Situlacrinus costatus* BREIMER, 1962 and the systematical position of *Cosmocrinus* JAEKEL, 1898 vs. *Costalocrinus* JAEKEL, 1918 are discussed.

Kurzfassung: Stratigraphische und systematische Aspekte von *Sphaerocrinus wolfgangschmidti* HAUSER & LANDETA, 2007 und *Situlacrinus costatus* BREIMER, 1962 sowie die Stellung von *Cosmocrinus* JAEKEL, 1898 vs. *Costalocrinus* JAEKEL, 1918 werden diskutiert.

Resumen: Se revisan aspectos de la sistemática de lost taxons *Sphaerocrinus wolfgangschmidti* HAUSER & LANDETA, 2007 y *Situlacrinus costatus*, así como sistemática de *Cosmocrinus* JAEKEL, 1898 vs. *Costalocrinus* JAEKEL, 1918.

Chronostratigraphy			Region		
			Asturias	Leon	
Upper Devonian	Famennian	Upper	Eremita	Eremita	
		Middle	?	?	
		Lower		Fueyo	
	Frasnian	Piñeres	Conglomerate	Crémenes	
Middle Devonian	Givetian			Nocedo	
				Valdoré	
	Eifelian	Candás	Portilla		
		Naranco	Hurgas		
		Moniello	Santa Lucía		
Lower Devonian	Emsian	Upper	Aguión	4 Coladilla	
		Lower	La Ladróna	3 Valporquero	
	Pragian		Bañugues	2 La Pedrosa	
					Felmin
	Lochkovian	Upper	Nieva	1	Nieva
		Lower	Furada		San Pedro

Geology (by Fernando Gomez LANDETA)

The base of Aguión Formation in the west shoulder of Arnao beach (Castrillón, Asturias, España), forms a tectonically inverted succession that starts up in the cliff with a massive white encrinite some 12-15 m. thick, followed at its base to the east by 10-12 m. of marls starting grey and passing to red-green colour upper up, all with centimetric intercalations of encrinite similar to the precedent and being its top converted by the sea. Thanks to old quarry operations and its horizontal position this beds outcrop in a ample area (some 5000-8000 m²). The very fossiliferous outcrop has attracted attention since old specially for its crinoidal fauna, being the locus typicus of many taxons among them the spectacular *Trybliocrinus flateanus* GEINITZ, 1867. The excellent and accessible outcrop has served and serves as a “book” example of bottom Lower Devonian (Upper Emsian) sea.

← **Text-figure 1:** Chronostratigraphy of the spanish Devonian (Asturias and León) by 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.

The paleoecology of this for them called “capas con *Trybliocrinus*”, (“*Trybliocrinus*-beds”), was analyzed by ARBIZU et. Al 1992. This authors find four communities, the lower dominated by bryozoans (*Fenestella* and *Isotrypa*), denoting clear waters, followed by

one composed by association of the brachiopod *Anathyris* with *Trybliocrinus*, culminating with one in which *Trybliocrinus* makes almost all the fauna, this gradual change the attribute to the progressive turbidity of the water.

For our part we note that in the lentoid encrinite bar at the base of the sequence we can determine in the broken cup fragments embedded in the same taxons (*Stammocrinus*, *Trybliocrinus*, ...), as in in the upper “*Trybliocrinus*-beds”. This encrinital bar system is the most developed of the founded in the Cantabrian Devonian, and extends, although in some parts reduced

to a one meter or less, for more than 120 km. along the Cantabrian “Arch”. Worthy of note is also that despite the abundance of big reef intervals in all Cantabrian Devonian, the Aguión as well the Lower Ladrón Formations, 300 m. thick in this area, with this beds at the middle, are devoid of reefs, (one biostrome 1-2 m. thick in the Upper Aguión being the exception). This facts make tempting a comparison with the conditions who existed in the Mississippian of the American interior craton as described by KAMMER & AUSICH, 2006. There the staggering quantity of crinoids is attributed by this authors to the absence of reefs, (eliminated in the precedent Famennian extinction), which allowed a free water circulation in a broad shelve not cut circuited by the reef frame. Then the surface able to the development of crinoidal communities is much ampler than in the case of the three typical facies of the reef, with the back-reef lagoon unsuitable for crinoids, the reef edifice with only few adapted taxons, and the fore-reef with its dept and turbidity militating also against robust crinoidal communities.

At the small scale we believe that this is also the case in the Cantabrian Devonian, with the non reefal Aguión Formation the more “crinoidal” with difference in comparing with the upper formations only with small communities in the fore-reef-facies and still less in the reefs (*Cupressocrinites* only). If this speculation proves true it could be generalized in that given a equatorial latitude in Devonian, the no existence of reef by what ever cause is a ground for crinoids.

Systematical and stratigraphical remarks on *Sphaerocrinus wolfgangschmidti* HAUSER & LANDETA, 2007 (by Joachim Hauser)

The juvenile dorsal cup of *Sphaerocrinus wolfgangschmidti* is decorated with a thick net by radially arranged, board-covering strips which cover the borders of the calyce almost completely. In the course of the growth of the cup these strips receded apparently mainly up to weakly intimated, net-shaped strips.



← Text-figure 2: Juvenil cup of *Sphaerocrinus wolfgangschmidti*; dimensions: $d_{(max.)} = 0,9$ cm., high = 0,6 cm.

Interesting the vertical spreading is also this taxon in the Spanish Devonian. It reaches after today's state of knowledge of the Middle Emsium till to the Lower Eifelium (see HAUSER & LANDETA, 2009:39) and the taxon was found in the Cantabrian Mountains as well as at the Asturias coastal profile.

Sphaerocrinus wolfgangschmidti seems to be the precursor of the Middle Devonian species of the Eifel Mountains. In the Rhenish-Slate-Mountains *Sphaerocrinus* occurs in the lower Junkerbergium (Rechert/Nims-Member to the border area Middle Eifelian to Heinzelt/Grauberg Member (see HAUSER, 2009:13) till to the Lower Givetium (Hustley Horizon, Submember 5; see HAUSER, 2011 in preparation).

Systematical and stratigraphical remarks on *Situlacrinus costatus* BREIMER, 1962

Up to now this taxon was only known from the Emsium (La Vid Shale) of the Lower Devonian of the Cantabrian Mountains (La Vid and Vil-layandre localities). In text figure 3 illustrated crinoid from the Aguión Formation of the Asturias coast line occurs as well as in the Stratum typicum (BREIMER, 1962:154: "Top beds of the La Vid Shale Formation" ≈ "Crinoidenlevel 1" after figure 40 of BREIMER).

→Text-figure 3: *Situlacrinus costatus* in situ from the Aguión Formation of the famous outcrop Arnao (Asturias, northern Spain); Dimensions: high = 1,5 cm.; diameter = 1,1 cm.



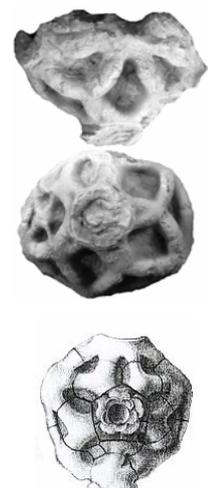
It is now proved that *Situlacrinus costatus* occurs in the shales of the La Vid formation of the Cantabrian Mountains as well as in the Lower Devonian reef-shales of the Asturian coast-line.

→Text-figures 4-6: Holotyp of *Costalocrinus dilatatus* (Museum of Comparative Zoology at Harvard College, MA, USA); below the original-draft of SCHULTZE, 1866: pl. 5, fig. 5b (aboral).



←Text-figure 7: Paratyp of *Situlacrinus costatus* after BREIMER, 1962: pl. 15, fig. 2 (the holotyp was not figured by BREIMER, 1962!).

First is to BREIMER, 1962:157 cited differentiation signs seems to say, that *Costalocrinus dilatatus* (SCHULTZE, 1866: pl. 5, fig. 5b) shows the same skeletal construction in the CD-interradius like *Situlacrinus costatus* (see BREIMER, 1962: pl. 15, fig. 2 & 3). The (ink-sutures) lines, the BREIMER with his tip responds „... there seems to be in specially plate at the internal side of the posterior interradius in the cup of *Cosmocrinus* ...”, is really no supplement-plate, how the SCHULTZE-drawing (pl. 5, fig. 5b) can also recognise well. Even more clearly one sees these circumstances in UBAGHS, et al., 1978: T. 611, fig. 396, fig. 5a & 5c.



This thesis also is underpinned by the detailed paper of McINTOSH, 1984 which shows on the page 1267 the cup pattern of *Cosmocrinus* (synonym: *Costalocrinus*). Also there is no extra plate in the CD-interradius.

The draftsman had taken over on the (relatively badly preserved) original crinoid (presumably from SCHULTZE himself; see text-figure 6) the draft-sutures on the dorsal-cup; at the same time, however, also very exactly the real borders.

As also the arm facets of both taxa hardly deviate each other, it is to be supposed that from the *Situlacriniten* in the Lower Devonian the *Cosmocriniten* have developed on average in the Middle Devonian.

To some confusion in the literature have led from JAEKEL, 1898 (*Cosmocrinus*) and JAEKEL, 1918 (*Costalocrinus*) introduced name for that of SCHULTZE, 1866:49 [161] described taxon *Poteriocrinus dilatatus*.

First is from the skeletal construction indisputably that this form does not belong to the taxon *Poteriocrinites*. JAEKEL, 1898 discussed the crinoid described by SCHULTZE thoroughly and summarises under his genus *Cosmocrinus* the species *Poteriocrinus dilatatus* SCHULTZE, 1866, *Cyathocrinus ornatissimus* HALL, 1843 and *Cosmocrinus holzapfeli* JAEKEL, 1898. If one disregards once the stratigraphical relevance of this species subsumed under *Cosmocrinus*, they are of BREIMER, 1962:156-157 cited arguments surely appropriately. *Costalocrinus* would be to be classify in future as a subjective synonym of *Cosmocrinus*.

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