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*A NEW CYRTOCRINID CRINOID FROM MIDDLE JURASSIC  
OF CENTRAL ITALY*

SUMMARY

A new cyrtocrinid is described from Bajocian sediments of central Italy and named *Ninocrinus parvulus* n. gen. n. sp. The characters of the new taxon suggest close relationships with eugeniocrinitids and phyllocrinids but also with saccocomids, such relationships could suggest deep changes in the Systematics. After a short analytic review a reiterative evolutionary model for free-living Articulata is also hypothesized.

RIASSUNTO

Viene descritta una nuova specie di crinoide cirtocrinida, *Ninocrinus parvulus* n. gen. n. sp., che è stata trovata in sedimenti di età bajociana dell'Appennino centrale (Italia). In base ai principali caratteri morfologici questo nuovo crinoide può essere avvicinato sia agli eugeniocrinitidi che ai phyllocrinidi e ai saccocomidi. Dopo una breve analisi si ipotizza un modello di evoluzione iterativa per i crinoidi Articulata «vaganti».

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## INTRODUCTION

Although we described new crinoids from Bajocian outcrops a few years ago (Manni & Nicosia, 1985; Castellana, Manni & Nicosia, 1989), one of the already described outcrops yielded another new form. The fossil bearing beds crop out along the road between Pieia and Pianello (Mt. Nerone, Central Apennines) where the well known Umbro-Marchean sequence is exposed clearly. Besides the quoted papers we refer for the geological setting and the sedimentological description to Cecca *et alii* (1987). The specimens come from a weak thickness of Bajocian «Posidonia» limestone that weathered produces a large amount of debris rich in crinoid elements. Among the finer washed elements a small form was distinguishable by its peculiarities, we believe it is a new species of a new genus and we shall describe it as *Ninocrinus parvulus* gen. n., sp. n.

## SYSTEMATICS

Order CYRTOCRINIDA Sieverts-Doreck, 1952

Suborder CYRTOCRININA Sieverts-Doreck, 1952

Family uncertain

The familiar position of the new genus was the most difficult problem to solve, due to the presence of some characters that distinguished it from the only known isochronous cyrtocrinids and alike forms as *Fischericrinus* Castellana, Manni & Nicosia, 1989 and *Phyllocrinus* Orbigny, 1850, even if it seemed clearly to belong to a same stem-group.

Genus *Ninocrinus* gen. n.

(type species: *N. parvulus* sp. n.)

*Diagnosis*: small stemmed cups with five radials, small and prominent radial facets and high, thin and subtriangular in cross-section interrarial projections. Wide and deep ventral cavity.

*Remarks*: the new genus shows characters transitional among *Fischericrinus* (similar radial facets), *Phyllocrinus* (high interrarial

projections) and *Saccocoma* Agassiz, 1836 (slender interradi-  
al projections). On the other hand it differs from *Fischericrinus* because with  
higher and thin subtriangular in cross-section interradi-  
al projections, from *Phyllocrinus* in the very slender interradi-  
al projections and in the radial facets because not placed between the interradi-  
al projections and from *Saccocoma* in the general shape of the cup and because  
stemmed.

*Derivatio nominis*: named after our friend Dr. Nino Mariotti.

*Occurrence*: as for the type species.

*Ninocrinus parvulus* sp. n.

(Fig. 1a-c; Pl. 1)

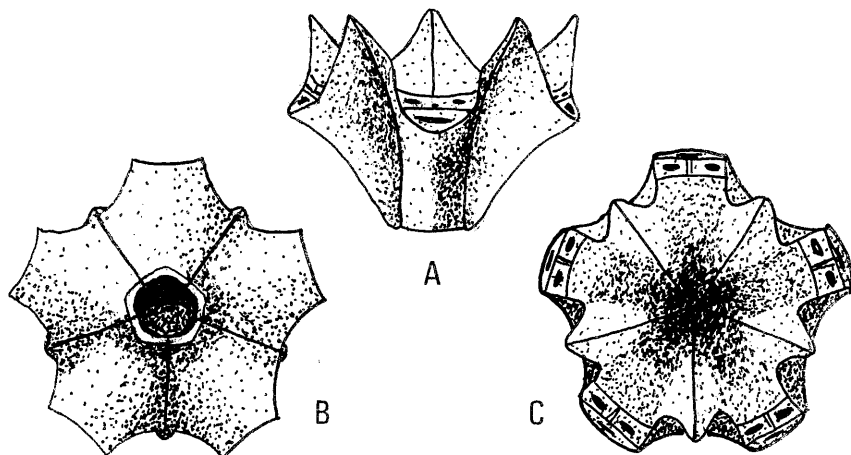


Fig. 1 - *Ninocrinus parvulus* gen. n., sp. n.

Reconstruction; a) lateral view; b) dorsal view; c) ventral view. (x 12).

*Description*: small pentalobate cup, tapered in the lower part,  
with high interradi-  
al projections. Sutures between the plates evident.  
External surface smooth. Radial facets sloped outwards and protrud-  
ing. Each facet with clear triangular ligament fossa, sloped outwards,  
and two larger subcircular muscular fossae separated by a radial ridge.  
Fulcral ridge with a central axial canal. The interradi-  
al projections, semilanceolate shaped, are concave externally and convex ventrally;  
besides they are high, thin, generally outwardly sloping and a little

triangular with inner vertex in cross section. The ventral cavity is wide and deep with parallel to the external surface walls, waved outline and sutures between the radials evident. The dorsal side, small and pentagonal in outline, is characterized by a small and not too deep cavity with a central axial canal.

*Dimensions (mm):*

	Hc	Hf	Hpr	Wf	Wpr	Dc	Dd
NS 6/449	1.9	1.2	0.7	0.6	0.7	2.2	0.7
NS 6/450	/	1.7	/	0.8	0.7	3.2	1.0
NS 6/451	/	1.6	/	0.6	0.8	2.6	/
NS 6/452	2.5	1.7	0.8	0.5	1.0	3.1	1.0
NS 6/453	2.3	1.5	0.8	0.3	1.0	2.6	1.0
NS 6/454	2.3	1.5	0.8	0.3	0.9	2.5	0.8
NS 6/455	2.3	1.6	0.7	0.3	/	2.4	1.0
NS 6/456	/	/	0.8	0.3	0.9	2.3	/

Hc : height of the cup (Hf + Hpr)

Hf : height of the cup without interradial projections

Hpr : height of the interradial projections

Wf : width of the radial facets

Wpr : width of the interradial projections

Dc : Diameter of the dorsal side

Dd : Diameter of the dorsal cavity

Plate I

*Ninocrinus parvulus* gen. n., sp. n. (all x 11).

Figs. 1-3 - paratype (NS 6/449): 1, lateral view; 2, ventral view; 3, dorsal view.

Figs. 4-6 - paratype (NS 6/453): 4, lateral view; 5, ventral view; 6, dorsal view.

Fig. 7 - paratype (NS 6/451): lateral view.

Figs. 8-9 - paratype (NS 6/456): 8, lateral view; 9, ventral view.

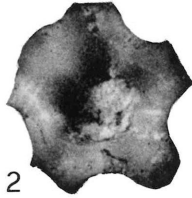
Fig. 10 - holotype (NS 6/452): lateral view.

Fig. 11 - paratype (NS 6/454): lateral view.

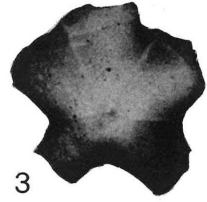
Fig. 12 - paratype (NS 6/455): lateral view.



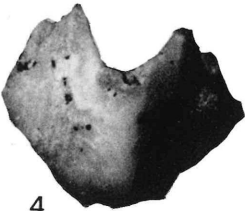
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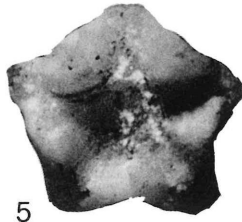
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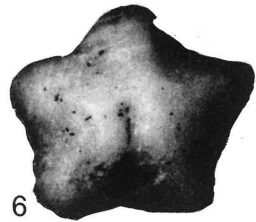
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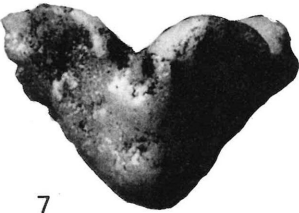
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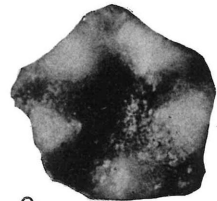
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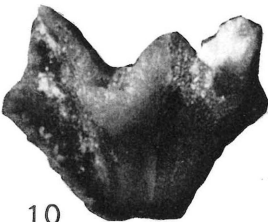
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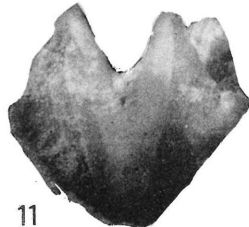
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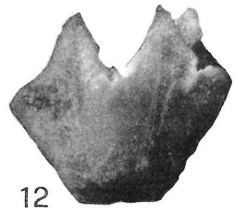
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11



12

*Depository*: the material is stored at the Museo di Paleontologia, Dipartimento di Scienze della Terra, Università «La Sapienza», Rome, with collection numbers: NS 6/.

*Material*: we have only eight cups labelled: NS 6/ 449-456 and some fragment labelled NS 6/ 457.

*Holotype*: NS 6/ 452.

*Paratypes*: NS 6/ 449, 451, 453-456

*Type locality*: the road between Pianello and Pieia villages, Mt. Nerone, Central Italy.

*Type level*: Bajocian.

*Derivatio nominis*: *parvulus*, diminutive of *parvus* (= small), due to the very reduced dimensions of the species.

*Remarks*: the main characters of this species are: protruding radial facets, thin and high subtriangular in cross-section interradial projections. In the whole these characters differentiate this species from all the other ones known up today. In the literature there is only one species quite similar to ours: *Eugeniocrinites taramelli* (Tommasi, 1908). This last Lower Cretaceous species is characterized by large interradial processes that resemble to those of *Phyllocrinus*, «but the large articular faces for the arms and the large radial cavity make it natural to refer the species to *Eugeniocrinites*» (Rasmussen, 1961, p. 226). Looking at the original drawings of Tommasi (1908, pl. 16, figs. 1-6) we believe that this species is very similar to our specimens but larger and with lower part narrower. It is probable that Tommasi's species can belong to the new genus.

Due to the state of preservation and to the very small sizes of the radial facets we are not able to discern the interarticular ligament fossae of the adoral articular surfaces.

## CONCLUSIONS

After the new findings the fauna coming from the Bajocian level at the Pieia outcrop includes 4 genera and 4 species, namely: *Crataegocri-*

*nus toniellii* Manni & Nicosia, 1984; *Fischericrinus sandrae* Castellana, Manni & Nicosia, 1989; *Phyllocrinus belbekensis* Arendt, 1974 (perhaps junior synonym of *P. furcillatus* Speden, 1959) and *Ninocrinus parvulus* gen. n., sp. n. Thus the small number of known Bajocian cyrtocrinid taxa is still increasing; in fact the number of Bajocian cyrtocrinid genera arose from the three forms known before 1984 up to the present eight (see Castellana, Manni & Nicosia, 1989, p. 76). Such sharp increase, practically originating only by material coming from the same outcrop, suggests that many forms, mostly among post Liassic fauna forerunners, are not still recorded (see also Castellana, Manni & Nicosia, 1989) and thus probably the Toarcian-Aalenian lack in the cyrtocrinid record strongly depends on taphonomic problems.

As before discussed the new form shows some affinities in the cup shape with the phyllocrinids for the large and subtriangular in cross-section interrarial projections and with the eugeniocrinitids for the radial facets. These affinities seem to be the character of most of the taxa present in the post-Liassic faunas and suggest the existence of a not too far common ancestor between phyllocrinids and eugeniocrinitids (Rasmussen, 1961, Manni & Nicosia, 1987). Contemporaneously it differs from phyllocrinids lacking in the typical small radial facets placed between the interrarial projections and from eugeniocrinitids in the thinness of interrarial projections.

Astonishingly close affinities are evidenced with saccocomids for the thin interrarial projections and the wide ventral cavity. The noticeable difference in respect to saccocomids is the presence of the stem and of interrarial projections relatively not so high. Such a resemblance seems to suggest the presence of a common ancestor for eugeniocrinitids, phyllocrinids and saccocomids. The close relationships between phyllocrinids and eugeniocrinitids are well known (Pisera & Dzik, 1979; Castellana, Manni & Nicosia, 1989) while relationships with saccocomids are more unacceptable and allow to believe that the latter evolved from stemmed forms in the early Upper Jurassic or shortly before.

Such a hypothesis contrasts with the current opinion suggesting that *Saccocoma* was somehow related to Triassic roveacrinids (Pisera & Dzik, 1979; Gluchowsky, 1987). This last opinion is also reflected by the present systematics arrangement (Rasmussen, 1978).

Thus we believe that we shall be obliged to change the systematic position of the whole Roveacrinida (sensu Rasmussen, 1978) taking off



Saccocomidae Orbigny, 1852 and rising them to superfamily level in the order Cyrtocrinida. A revision of the Family Saccocomidae is in progress (Ettensohn, Manni & Nicosia in prep.).

#### SOME THOUGHTS ON THE EVOLUTIONARY PATTERN IN FREE-LIVING ARTICULATA

Descent of free-living (or stemless) Articulata is quite unclear (for a short historical review see Rasmussen, 1978 and Gluchowsky, 1987). They are currently ascribed to three orders: that is to Comatulida Clark, 1908 (including comatulids and thiolliericrinids), Roveacrinida Sieverts-Doreck, 1952 (including roveacrinids, somphocrinids and saccocomids) and Uintacrinida Broili, 1921 (uintacrinids and marsupitids) or alternatively and perhaps more correctly to Isocrinida Sieverts-Doreck, 1952 (including comatulids and thiolliericrinids), Roveacrinida and Uintacrinida. In general their phylogenesis is still strongly doubtful, with the exception of the comatulids for which an anagenetic evolution from isocrinids seems well proved (Hess, 1951; Simms, 1988). Also the thiolliericrinids were recently reexamined by Klikushin (1987) and related to an isocrinid ancestor.

Roveacrinids, somphocrinids and saccocomids (these last including also doubtful forms as *Pseudosaccocoma* Remes, 1905 and *Applino-crinus* Peck, 1973) were ascribed by Peck (*in* Rasmussen, 1978) to the order Roveacrinida without any evidence of common derivation but probably only on the basis of the lack in stem and in cirral bearing centro-dorsal element. Concerning this group, first at all, we have to pull apart the saccocomids strongly different for many characters from all the other forms there included and that we believe were originated from a form of the cyrtocrinid group. On the origin of the Roveacrininae Peck, 1943 and Somphocrininae Peck, 1978 we can only say, according to Bizzarini *et alii* (1990), that the dorsal spine (Ds) typical of somphocrinids, seems to originate by fusion of BB, present also in roveacrinids, while the centro-dorsal element (Cd) of comatulids and thiolliericrinids clearly originates from packed and fused cirriferous columnals. Thus the Ds and the Cd element are to be considered as a clearly analogous characters testifying contemporaneously:

1) a common, even if unknown, ancestor both for roveacrinids and for somphocrinids;

2) a different origin for the roveacrinid-somphocrinid group from one side and the comatulid-thiolliericrinid group from another.

Both uintacrinid genera, still strongly problematic as a whole, were assumed as descending from an unknown Inadunata; we can not go over in this field but surely they are not imaginable as the result of a whatever evolutionary process, neither coming from saccocomids nor from comatulids, roveacrinids and somphocrinids. Actually is quite difficult to hypothesize their pertaining to the Articulata.

Thus the analysis of the characters of the various single groups shows that the presence of a common ancestor is to be excluded among all of them and we have now to consider five distinct groups of free-living Articulata:

Isocrinid descendents	(Comatulids);
Isocrinid descendents	(Thiolliericrinids);
Cyrtocrinid descendents	(Saccocomids);
unknown origin	(Uintacrinids);
unknown origin	(Somphocrinids-Roveacrinids).

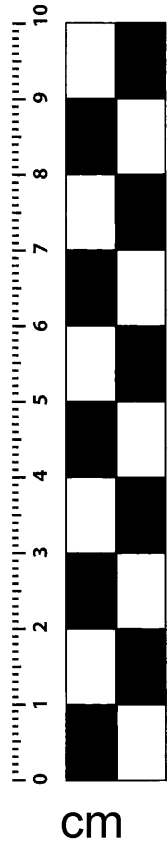
They share exclusively a convergence character, the loss of the stem. The stemlesses, present also in some Paleozoic forms, was reached at different times; comatulids and thiolliericrinids had Early Jurassic appearance, saccocomids appeared in the Upper Jurassic, uintacrinids had their distribution in the Upper Cretaceous while somphocrinids were Middle and Upper Triassic forms and roveacrinids were exclusively Cretaceous in age. Moreover comatulids ad thiolliericrinids had Tethyan distribution as well as saccocomids; uintacrinids occurred worldwide; somphocrinids constituted with their massive occurrence the «Osteocrinus-facies» in the Alps whereas are only scattered in Mexico; finally roveacrinids are known from USA and Mexico.

On the whole this seems a good example of parallel and reiterative evolution showing that free-living Articulata were independently originating from different lineages, at different times and in different basins. The same evolutionary pattern was already hypothesized (Simms, 1988; Manni & Nicosia, 1990) for other orders of the Articulata and could explain some present discrepancies in the Systematics arrangement.

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