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Evolutionary Trend of the Genus *Lithastrinus* to the Genus *Uniplanarius*

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With 1 Figure and 3 Plates

Alabama
Campanian
Calcareous nannofossils
Evolution
Lithastrinus
Uniplanarius

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Zusammenfassung

Eine neue kalkige Nannofossilienart, *Lithastrinus quadricuspis*, wird beschrieben. Die nur aus vier Kalzitstrahlen aufgebaute Art, die sich wahrscheinlich aus *Lithastrinus grillii* herleiten läßt, hat sich offensichtlich während des Campans zu *Uniplanarius sissinghii* (PERCH-NIELSEN, 1986) nov. comb. entwickelt.

Abstract

A new calcareous nannofossil species, *Lithastrinus quadricuspis*, is described. This species which has only four calcite rays is assumed to have evolved from *Lithastrinus grillii* and observed to evolve into the species *Uniplanarius sissinghii* (PERCH-NIELSEN, 1986) nov. comb. during the latest Campanian.

1. Introduction

During a study of calcareous nannofossils from the Upper Cretaceous strata of Alabama and Mississippi, USA, a new species of *Lithastrinus* STRADNER 1962, *L. quadricuspis*, was found. Detailed study of this new species and *Uniplanarius sissinghii* (PERCH-NIELSEN, 1986) nov. comb. shows, that the validity of the latter species as a stratigraphic marker is questionable.

2. Previous Work

An evolutionary trend within the genus *Eprolithus* STOVER 1966 which took the form of a progressive reduction in the number of calcite elements was first recognised by PRINS (in PERCH-NIELSEN, 1979). PRINS de-

finied the first species of *Eprolithus* as a cylinder of 15–20 elements constricted by a diaphragm formed of the same number of elements. He recorded an evolutionary trend from *Eprolithus* to *Lithastrinus*, within which he placed forms with 6 and 5 rays. Species with four elements he placed in the genus *Quadrum* PRINS & PERCH-NIELSEN in MANIVIT et al. (1977), which first occurs in the Turonian and later evolved into the genus *Micula* VEKSHINA 1959 in the Coniacian.

The holotype of the type species of *Quadrum*, *Q. gartneri*, was considered by THIERSTEIN (1974) to be a preservationally conspecific morphotype of *Micula stauropora* and by ROTH & BOWDLER (1979) as a junior synonym of *Micula stauropora*. The latter idea was followed by HATTNER & WISE (1980), which led them to introduce a new genus *Uniplanarius* using *Tetralithus gothicus* DEFLANDRE 1959 as its type species.

Conversely, CRUX (1982) described in detail the differences between *Micula stauropora* and *Quadrum gartneri* and discussed a morphological trend from *Quadrum gartneri* ssp. 1 to *Micula stauropora* in the Coniacian.

3. Present Study

The genus *Lithastrinus* was originally described by STRADNER (1962) as circular nannofossils with 6 to 11 wall forming elements and a central diaphragm composed of the same number of calcite plates. In the present material a species of *Lithastrinus* (*L. quadricuspis*) with only 4 rays was found. It has been observed in the present study that *L. quadricuspis* developed progressively shorter "proximal" ends of the calcite rays while the "distal" part of the rays became narrower and longer (Fig. 1). The central diaphragm becomes reduced in

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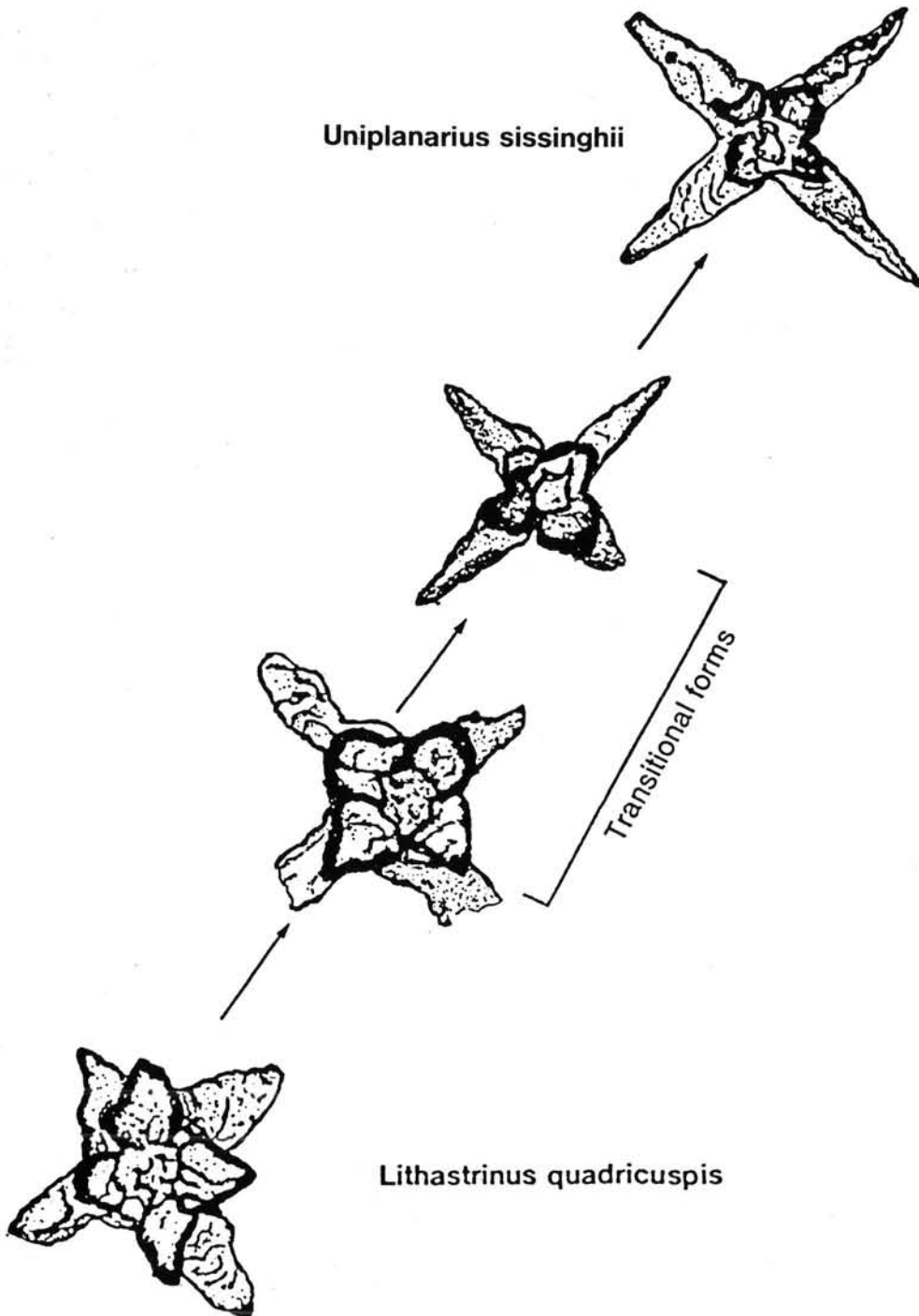


Fig. 1: Evolutionary trend between *Lithastrinus quadricuspis* and *Uniplanarius sissinghii*.

size to eventually disappear in the genus *Uniplanarius* (Fig. 1).

The end member of this lineage is assigned to the genus *Uniplanarius* and not the genus *Quadrum*, as this latter genus is thought to have evolved from *Lithastrinus* already in the Turonian.

The genus *Uniplanarius* is a valid genus although the present author agrees with CRUX (1982) who proved the validity of *Quadrum gartneri* as a separate species from *Micula staurophora*. The species name *U. sissinghii* is adopted for the end member of the evolutionary lineage as the previously used name *Tetralithus nitidus* MARTINI

1961 is a species restricted to the Eocene as reported by AUBRY in PERCH-NIELSEN (1985). AUBRY pointed out that MARTINI's (1961) type material for *T. nitidus* is of Eocene, not Cretaceous age and the holotype does not belong to the same species as the similar Cretaceous forms. PERCH-NIELSEN (1986) renamed these forms as *Quadrum sissinghii*, which here is recombined to *Uniplanarius sissinghii* for the reasons given above.

It is difficult to identify transitional forms between *L. quadricuspis* and *U. sissinghii* under the light microscope. Thus the use of the first occurrence of *U. sissinghii* in biostratigraphy is unreliable.

4. Taxonomy

Genus *Lithastrinus* STRADNER 1962

Lithastrinus quadricuspis sp. nov.

(Pl. 1, figs. 1–4; Pl. 2, fig. 1)

Derivation of the name: quadri = four; cuspis = point.

Diagnosis: A species of *Lithastrinus* with a small central area and two tiers of four rays.

Description: A species with 4 radial rays arising at each side of the diaphragm. In the small central area only 4 small distinctive elements (Pl. 1, Fig. 2) are visible. One side has shorter rays than the other.

Remarks: This species can be easily distinguished from the other species of the genus *Lithastrinus* by having only 4 radial rays per tier. The present material shows a trend that the short rays became shorter with time.

Holotype: UCL-1418-26; Pl. 1, Fig. 1.

Type locality: Sample B-USGS, A-76-10 section; Alabama.

Type level: Upper Campanian – Lower Maestrichtian.

Size: 8–11 µm.

Genus *Uniplanarius* HATTNER & WISE 1980

Uniplanarius sissinghii (PERCH-NIELSEN)

nov. comb.

(Pl. 2, fig. 4)

- 1968 *Tetralithus nitidus* MARTINI; GARTNER (partim), p. 42,43, pl. 13, fig. 3 (non pl. 9, fig. 14; pl. 13, fig. 4)
 1977 *Quadrum nitidum* (MARTINI); PRINS & PERCH-NIELSEN in MANIVIT et al., p. 178
 1985 *Quadrum sissinghii* PERCH-NIELSEN, p. 390, figs. 9,13
 1986 *Quadrum sissinghii* PERCH-NIELSEN, p. 838, pl. 3, figs. 3–5.

Remarks: Due to the morphological trend between the genus *Lithastrinus* to *Uniplanarius* as discussed above, the generic name *Uniplanarius* should be used for this species.

5. Summary

- 1) The genus *Lithastrinus* shows a trend to reduce the number of elements from 20–15 to 4 elements from the Hauterivian to the Campanian.
- 2) There is a morphological trend between *Lithastrinus quadricuspis* and *Uniplanarius sissinghii*.

- 3) The use of the inception of *U. sissinghii* as a biostratigraphic datum is questionable.

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Plate 1

- Figs. 1–2: *Lithastrinus quadricuspis* sp. nov.
Holotype. Demopolis Formation. Sample no. B. USGS-Alabama-76-10.
1: Distal view, × 4900 (SEM). UCL-1418-26.
2: Same specimen, × 9130 (SEM). UCL-1418-27.
- Fig. 3: *Lithastrinus quadricuspis* sp. nov.
Bluffport Marl Member. Sample no. E. USGS-Alabama-76-10.
Distal view, × 7890 (SEM). UCL-1445-7.
- Fig. 4: *Lithastrinus quadricuspis* sp. nov.
Demopolis Formation. Sample no. B. USGS-Alabama-76-10.
Side view, × 7370 (SEM). UCL-1418-28.

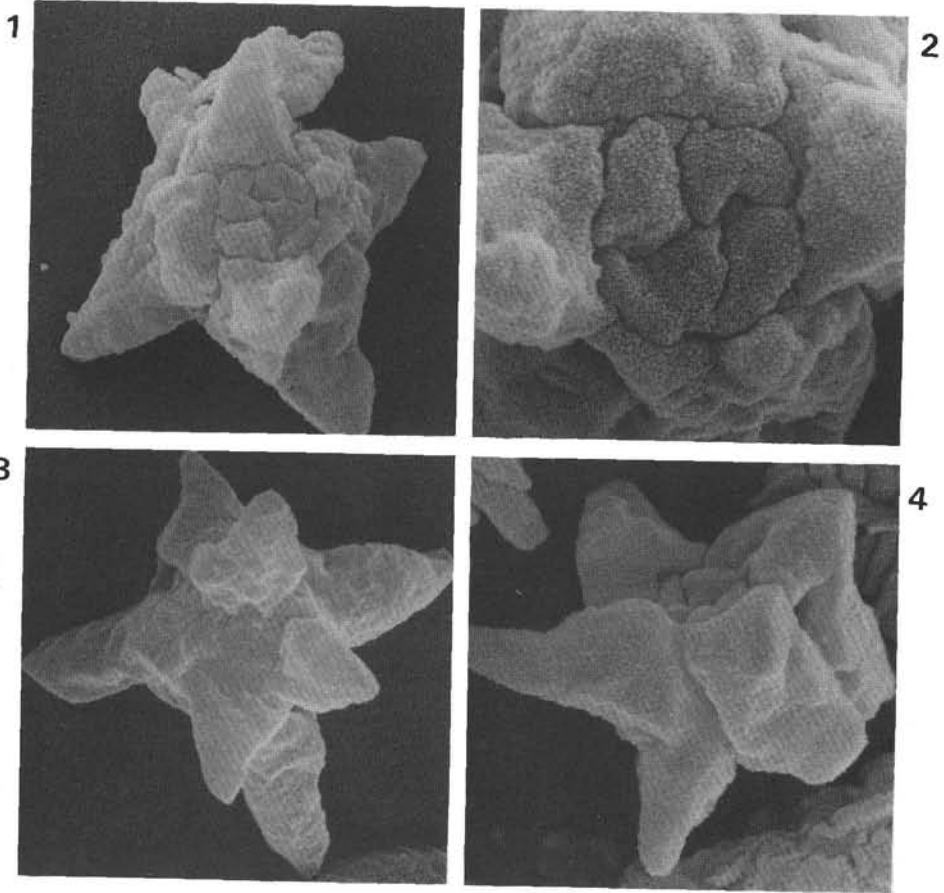
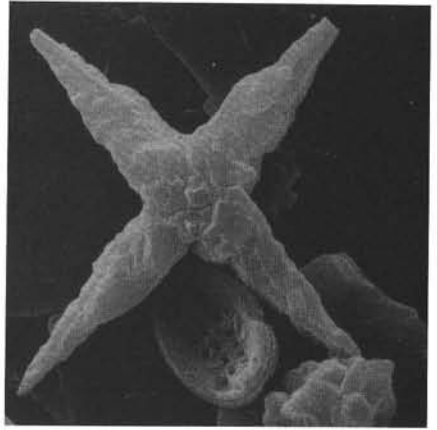
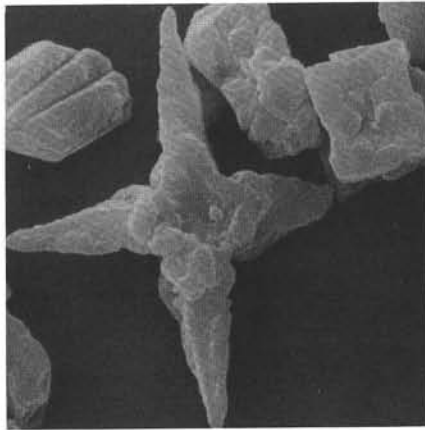


Plate 2

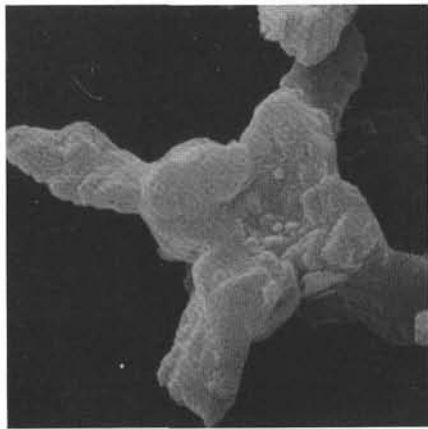
- Fig. 1: *Lithastrinus quadricuspis* sp. nov.
Bluffport Marl Member. Sample no. E. USGS-Alabama-76-10.
Distal view, × 7140 (SEM). UCL-1418-15.
- Fig. 2: Transitional form.
Bluffport marl Member. Sample no. E. USGS-Alabama-76-10.
Distal view, × 6810 (SEM). UCL-1445-11.
- Fig. 3: Transitional form.
Bluffport Marl. Sample no. F. USGS-Alabama-76-10.
Distal view, × 2570 (SEM). UCL-1445-19.
- Fig. 4: *Uniplanarius sissinghii* (PERCH-NIELSEN) nov. comb.
Bluffport Marl. Sample no. F. USGS-Alabama-76-10.
Distal view, × 2660 (SEM). UCL-1445-6.



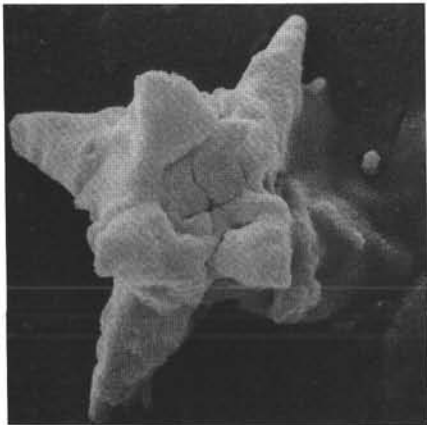
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1

Plate 3

Fig. 1–2: Transitional form.

Upper Campanian – Lower Maestrichtian. Bluffport Marl. Sample no. D. USGS-Alabama-76-10.

1: Phase contrast with one nicol, $\times 2880$ (LM). UCL-1669-15.

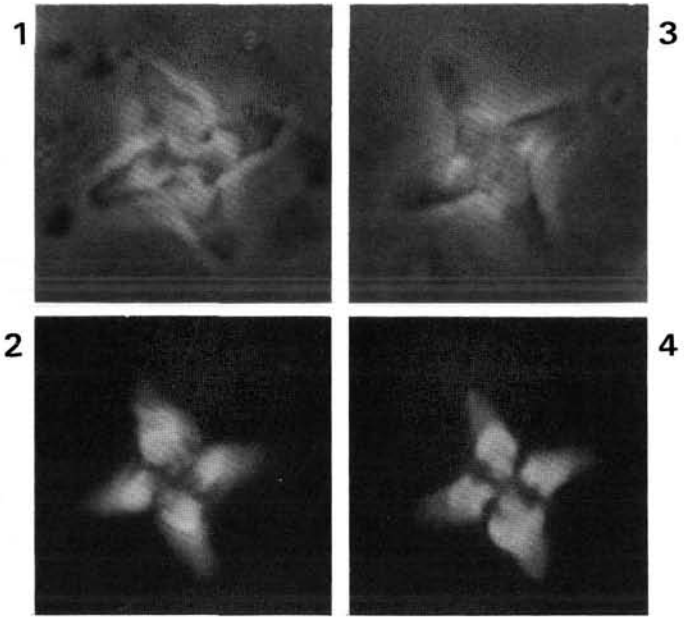
2: \times nicols, $\times 2880$ (LM). UCL-1669-12.

Fig. 3–4: Transitional form.

Upper Campanian – Lower Maestrichtian. Bluffport Marl. Sample no. D. USGS-Alabama-76-10.

3: Phase contrast with one nicol, $\times 3580$ (LM). UCL-1669-16.

4: \times nicols, $\times 2980$ (LM). UCL-1669-13.



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