ORASTRUM COLLIGATUM, A NEW HOLOCOCCOLITH SPECIES FROM THE CENOMANIAN OF THE RUSSIAN CRATON (UKRAINE)

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Abstract: A new holococcolith species, *Orastrum colligatum* sp. nov., is described from well-preserved assemblages from the Cenomanian deposits in proximity to Bryansk, Ukraine. The holococcolith is characterised by four smooth, interlocking, crystallographically-coherent blocks. Similarities to, and distinct morphological differences from, other holococcolith taxa are discussed.

Introduction

During the course of an investigation of Upper Albian-Turonian calcareous nannofossils from the Russian Craton (Henderiks, 1996), a new holococcolith species was encountered in Nannofossil Zones CC9-10 (the Eiffellithus turriseiffelii and Microrhabdulus decoratus Zones of Sissingh, 1977, later refined by Perch-Nielsen, 1985). Both the relative abundance (up to 14%) and the restricted vertical occurrence of this species in the studied sections have made it suitable for biostratigraphical correlation in this region. This new species is described herein. The material was collected by Dr. A.V. Ilyin (Institute of Lithosphere, Moscow, Russia). Location details are provided in Ilyin (1994, fig.3, sections I and V).

Taxonomy

The type-material and photographic negatives are deposited in the National Natural History Museum, Leiden, The Netherlands. All taxa and taxonomic references appearing herein can be found in Bown (in press).

Genus: *ORASTRUM* Wind & Wise *in* Wise & Wind, 1977

Type species: *Orastrum asarotum* Wind & Wise *in* Wise & Wind, 1977

***Orastrum colligatum* Henderiks & Ziveri sp. nov.**
Plate 1, Figures 1-7

Diagnosis: Medium-sized, elliptical, moderately-birefringent holococcolith constructed of four smooth, interlocking, crystallographically-coherent blocks, forming an offset X in the central area.

Description: The new holococcolith consists of four blocks, each possessing a bar which extends into the central area. These bars interlink in an offset X and bear lateral teeth which project into the elongated central-area perforations and are visible with the SEM in both distal and proximal views.

A distal SEM view (Plate 1, Figs 1-2) reveals deeply incised sutures separating the four blocks. The sutures are partly obscured by the rectangular sides of the two blocks that lie about the short ellipse axis, which overlap the other two blocks. The sutures in the central X-structure are straight, although partly obscured by calcite overgrowth.

In proximal SEM view (Plate 1, Figs 3-4), the overall smoothness of the blocks is very clear and the sutures between them are slightly curved and deeply incised. The characteristic interlocking pattern of the blocks is clearly displayed under cross-polarised light (Plate 1, Figs 5 and 7).

Dimensions: Holotype - length 4.8µm, width 3.3µm. Paratypes - maximum length 6.4µm, maximum width 4.2µm.

Remarks: This species is placed in the holococcolith genus *Orastrum* because the distal surface of the holococcolith does not support a ridged stem, as described for the holococcolith genera *Calculites* and *Lucianorhabdus* (see Farhan *et al.* (1994) for discussion). *O. colligatum* also appears not to possess microcrystalline structure and to be non-cavate, being composed of four blocks with crystallographic continuity, as attributed to *Orastrum* (Farhan *et al.*, 1994). The new species does not possess a central pore, unlike *Calculites*, *Lucianorhabdus* and *O. asarotum*, nor an elongated slit down the centre of the coccolith, as in *Orastrum porosuturalis*, but instead possesses a central X which encloses four equidimensional, elongated perforations, into which teeth extend laterally.

The similar stratigraphical ranges of the newly-described holococcolith and *Calculites anfractus* makes a detailed comparison necessary. As opposed to the original description of Jakubowski (1986), *O. colligatum* does not display an occluded central structure characterised by an S-shaped suture, but instead the previously described central X-structure. More extensive calcite overgrowth might result in an occluded central structure in *O. colligatum*, with the zigzag sutures as described for *C. anfractus*, but in this study no distinctive preservational variability was observed with the LM, both within the same sample and throughout the 6m interval in which the species was encountered. Therefore, we describe a new species, but acknowledge that it is morphologically similar to *C. anfractus*.

Derivation of name: Latin *colligatum*, meaning 'bound, tied together', referring to the interlocking blocks which comprise this species.

Occurrence: *O. colligatum* is present in Nannofossil Zones CC9 and possibly CC10 (uppermost Albian-Middle Cenomanian) in two sections located near Kiev (Kursk and Bryansk region), Ukraine. Throughout the interval containing *O. colligatum* (samples 94K4/6-13), the nannofloral assemblages contained *Eiffellithus turriseiffelii* and *Gartnerago theta*, which constrains the age of the samples to between CC9a (FO of *E. turriseiffelii*) to CC10a (LO of *G. theta*). The marker-species for subzones within CC9 and CC10 (*Corollithion kennedyi*, *Lithraphidites acutus*, *Helenea chiastia*, *Axopodorhabdus albianus*) were not observed, and are assumed not to have been present on the Russian Craton

Platform. In the lower samples, *Seribiscutum primitivum* (samples 94K4/6-10) and *Gartnerago nanum* are also present. Mortimer (1987) defined zones in the Southern Norwegian and Danish North Sea area based on the last downhole occurrences (LDOs) of *G. nanum* (top of NK19) and *S. primitivum* (top of NK18). He appears to have equated the LDO of the former to the first occurrence (FO) of *L. acutus* (that is, the base of CC10a), and the LDO of *S. primitivum* was shown to fall between the FO of *L. acutus* and the last occurrences (LOs) of *Rhagodiscus asper* and *A. albianus* (that is, somewhere higher in CC10a) (see Mortimer, 1987, fig.8). According to Burnett (in press), the range of *G. theta* is from the Lower Cenomanian Mantelliceras mantelli Ammonite Zone (CC9b) to the Middle Cenomanian Acanthoceras rhotomagense Ammonite Zone (CC10a), and it is therefore likely that the range of *O. colligatum* is CC9b-10a (uppermost Albian/lowermost Cenomanian to Middle Cenomanian). Similar holococcoliths have been observed in Upper Albian deposits of the North Sea in the area of the South Halibut Basin (Dr. L. Gallagher, pers. comm., 1997). The LO of *O. colligatum* was observed in samples 94K4/13(V) and 94K28/8(I) (Henderiks, 1996).

Holotype: Plate 1, Figure 1; negative RGM-342 405; sample 94K4/10.

Paratypes: Plate 1, Figures 2-7; negatives RGM-342 400/402/406/408/409/410; sample 94K4/10.

Type locality: Section Kiev 94K4, Bryansk region, 350km SW of Moscow (see Ilyin, 1994, fig.3, section V).

Type level: Section Kiev 94K4, 5.65m below a facies change from glauconitic sands into chalks. This facies change is associated with the Cenomanian-Turonian Boundary Event (Henderiks, 1996).

Acknowledgements

We wish to thank Jackie Burnett, Katharina von Salis Perch-Nielsen, Ben Prins and Jan van Hinte who provided helpful suggestions; Bruce Fouke and Alexandra Nederbragt for initiating the project; and Saskia Kars for supplying the SEM images taken at the Vrije Universiteit, Amsterdam.

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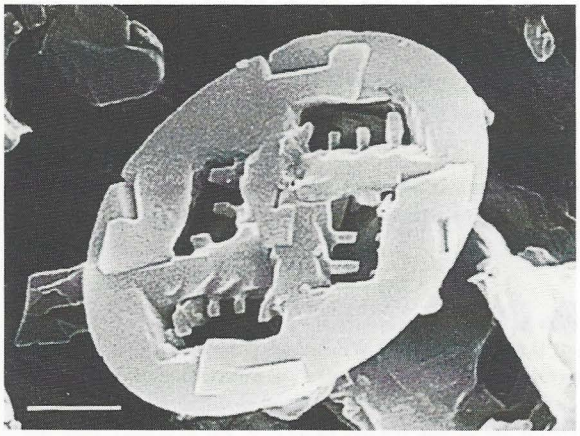
PLATE 1



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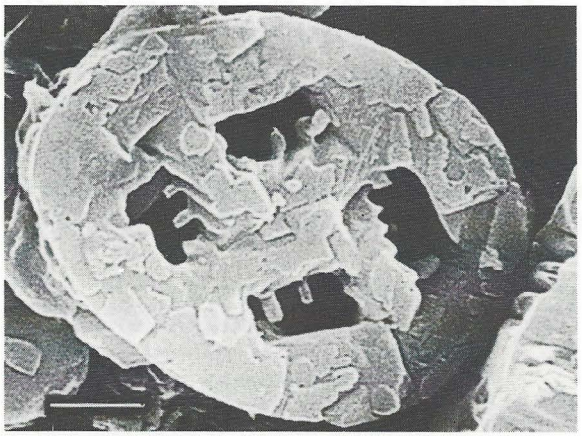

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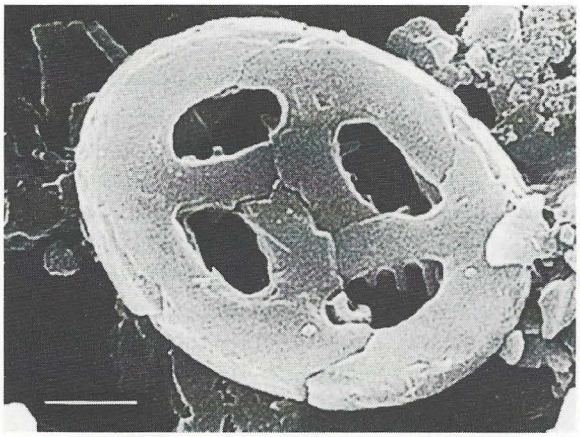

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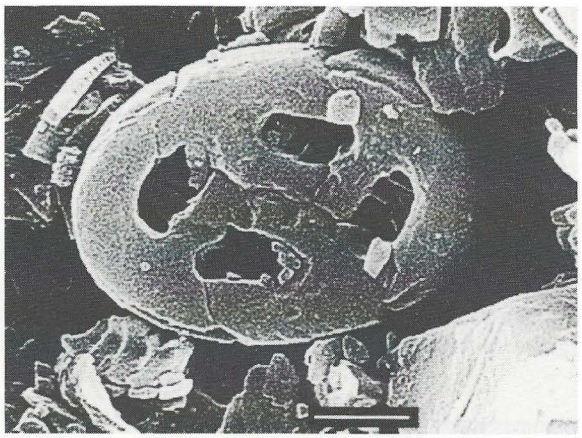

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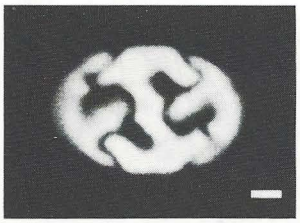

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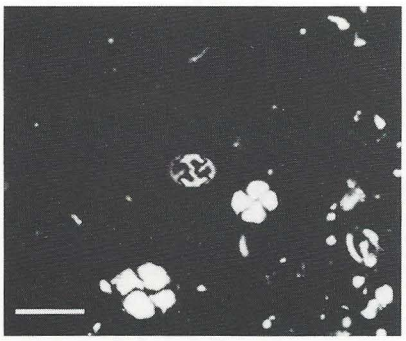

7

Figs 1-7 *Orastrum colligatum* nov. sp. Henderiks & Ziveri

all scale bars 1 µm

Holotype:

1. Distal view, RGM -342 405. Upper Albian-Lower Cenomanian (Sample 94K4/10 -Bryansk, Ukraine).

Paratypes:

2. Distal view, RGM -342 400. As 1.

3. Proximal view, RGM -342 406. As 1.

4. Proximal view, RGM -342 402. As 1.

5. Crossed-polars, RGM -342 409. As 1.

6. Phase-contrast, RGM -342 410. As 1.

7. Crossed-polars, RGM -342 408. Scale bar 10 µm. As 1.