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Emiliana coronata, a new calcareous nannoplankton species from the North Atlantic Pleistocene

By
ERLEND MARTINI^{*})

With 1 Text-figure and 2 Plates

ABSTRACT

A new species of the genus *Emiliana* (*E. coronata* n. sp.) is described from the late Pleistocene of the North Atlantic Ocean. Its phylogenetic relationship and stratigraphic occurrence based on the accompanying calcareous nannoplankton

assemblage is discussed. *Bramletteius? duoalatus* (MARTINI 1980) from the late Pliocene is transferred into the genus *Gephyrocapsa* KAMPTNER.

KURZFASSUNG

Es wird eine neue Art der Gattung *Emiliana* (*E. coronata* n. sp.) aus dem höheren Pleistozän des Nordatlantischen Ozeans beschrieben. Die phylogenetischen Beziehungen und das stratigraphische Vorkommen werden aufgrund der begleitenden

Nannoplankton-Gemeinschaft diskutiert. *Bramletteius? duoalatus* (MARTINI 1980) aus dem höheren Pliozän wird in die Gattung *Gephyrocapsa* KAMPTNER überführt.

1. INTRODUCTION

During shore-lab investigation of Leg 49 material of the Deep Sea Drilling Project (DSDP) in 1977 a probably new taxon was discovered, but was not described in the report on calcareous nannoplankton and silicoflagellate biostratigraphy of Sites 407 and 409 at the Reykjanes Ridge (MARTINI 1979) because priority of shipboard investigations (STEINMETZ 1979). However, this form was not mentioned in the Leg 49 reports or described later. Detailed REM-investigations revealed details not recognized in any published taxa, therefore the description of a new species seems justified.

The new taxon is common in sample 409-2-1: 7-8 cm, recovered at DSDP-Site 409 at the Reykjanes Ridge (Fig. 1), approximately 24,5 meters below seafloor. The succession in core 2 of Site 409 comprises of calcareous sandy mud, which was placed by shipboard scientists in planktonic foraminiferal

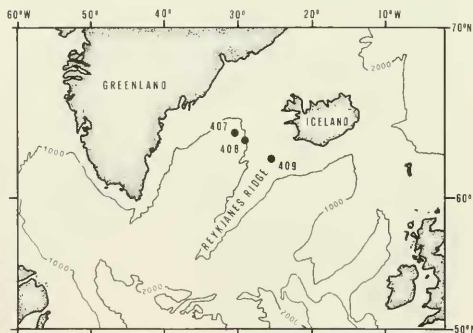


Fig. 1: Location of sites drilled in the Reykjanes Ridge area during DSDP Leg 49.

^{*}) Prof. Dr. ERLEND MARTINI, Geologisch-Paläontologisches Institut der Universität, Senckenberg-Anlage 32-34, D-60325 Frankfurt am Main.

zone N 22 and calcareous nannoplankton zone NN 19 (*Pseudoemiliana lacunosa* zone) (LUYENDYK, CANN et al. 1979). It was also stated that the succession included a series of turbidites, grading from sandy mud at base upward to calcareous mud or nannofossil ooze at top.

The calcareous nannoplankton assemblage of sample 409-2-1: 7-8 cm was placed in calcareous nannoplankton zone NN 21 (*Emiliana huxleyi* zone) by MARTINI (1979). Both nannoplankton placements were probably partly caused by the new form, since it exhibits features of the index species of both

zones. During reinvestigation of the calcareous nannoplankton assemblage of sample 409-2-1: 7-8 cm species listed in part 3 were identified, suggesting a position of this particular level in calcareous nannoplankton zone NN 20 (*Gephyrocapsa oceanica* zone) as discussed in detail below.

Thanks are due to Dr. K. PERCH-NIELSEN (Zürich) for discussion, and Mr. J. TOCHTENHAGEN (Frankfurt/Main) for REM-assistance.

Type material is deposited in the „Forschungsinstitut und Naturmuseum Senckenberg“ Frankfurt/Main (SM. B. 14495).

2. DESCRIPTION OF THE NEW SPECIES

Class Coccolithophyceae ROTHMALER, 1951

Family Coccolithaceae KAMPTNER, 1928

Genus *Emiliana* HAY & MOHLER, 1967

Emiliana coronata n. sp.

Pl. 1, Figs. 1-9

Type locality: DSDP Site 409, Reykjanes Ridge, North Atlantic Ocean (62°36.98'N 25°57.17'W).

Type level: DSDP 409-2-1: 7-8 cm, late Pleistocene.

Holotype: SM. B. 14495, Pl. 1, Fig. 3.

Description: Two closely compressed oval shields connected by a central column, and with a moderately large central opening spanned by a grill. Shields convex distally, and concave proximally. Proximal shield slightly smaller than distal one. Distal shield consists of approximately 30 to 40 elements, often with irregular spaced slits between elements. Central collar with high vertical elements slightly bent outward, and depressed at two places diagonally orientated to the long axis of the coccolith. Rim of both shields and collar slightly undulated.

With the lightmicroscope difficult to identify in plan view, although the central collar exhibits a distinct brightness of somewhat greenish appearance under crossed nicols. In side view the collar is clearly seen as two diverging bright projections in certain positions.

Length: 2,8 - 3,9 μ . Width: 2,3 - 2,8 μ . Height: 1,6 - 1,9 μ .

Relations: The new species is closely related to *Emiliana huxleyi* (LOHMANN), but differs in having irregular slits between elements in the distal shields like *Pseudoemiliana lacunosa* (KAMPTNER) rather than having T-shaped elements. Also the high collar is not present in *E. huxleyi*. However, OKADA & MCINTYRE (1977) described a modern subspecies (*E. huxleyi corona*) which has a similar collar, but elements in the shields of these forms are T-shaped. In 1979 NISHIDA presented a REM-picture of a modern unnamed coccosphere from the northwestern Pacific which shows resemblance with the new species. A somewhat similar construction is found in *Gephyrocapsa ornata* (HEIMDAL 1973), but vertical elements are toothlike, and the central area is spanned by a narrow bridge with two bladlike elements, never found in *E. coronata* n. sp. (based on more than 300 specimens investigated by REM-techniques).

In *Gephyrocapsa mediterranea* of PIRINI-RADREZZANI & VALLERI (1977) and *Gephyrocapsa florenzia* of LOHMANN & ELLIS (1981), both described from the Mediterranean Pliocene and early Pleistocene and probably the same species, the bridge spanning the central area is rather broad and consists of several elements starting at the base like those of *E. coronata*, but are bent inward in the upper part to form the bridge.

3. COMMENTS AND STRATIGRAPHIC POSITION

In sample DSDP 409-2-1: 7-8 cm the following species (most figured in plates 1 and 2) listed below with their frequency (R = rare, F = few, C = common) were identified during the reinvestigation:

Braarudosphaera bigelowi (GRAN & BRAARUD)

DEFLANDRE & FERT, 1947

Coccolithus pelagicus (WALLICH) SCHILLER, 1930

Coronosphaera mediterranea (LOHMANN) GAARDER, 1977

Cyclococcolithus leptoporus (MURRAY & BLACKMAN) KAMPTNER, 1954 ex 1956

Emiliana coronata n. sp.

Gephyrocapsa aperta KAMPTNER, 1963

Gephyrocapsa ericsonii MCINTYRE & BÉ, 1967

Gephyrocapsa oceanica KAMPTNER, 1943

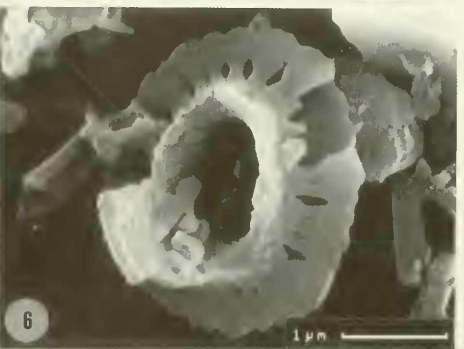
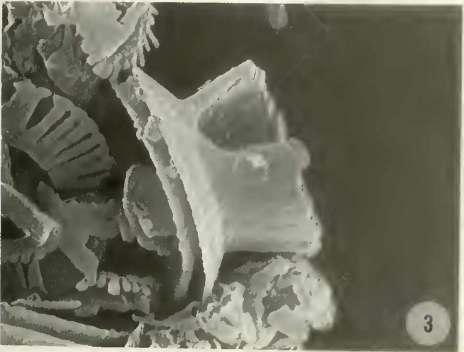
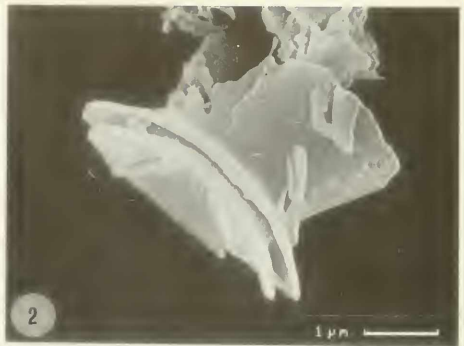
Helicosphaera carteri (WALLICH) KAMPTNER, 1954

Syracosphaera pulchra LOHMANN, 1902

R
C
R
C
C
F
R

Plate 1 *Emiliana coronata* n. sp. - All DSDP Leg 49, Sample 409-2-1: 7-8 cm, Pleistocene.

Fig. 1-4, 7: side views; Fig. 5: side and proximal view; Fig. 6, 8-9: distal views. Fig. 3: Holotype SM. B. 14495; Figs. 1-5, 7-9 = REM 13500 x; Fig. 6 = REM 19000 x.



In this assemblage neither *Pseudoemiliana lacunosa* (KAMPTNER) nor *Emiliana huxleyi* (LOHMANN) were found. The former citation of *Emiliana huxleyi* in sample 409-2-1: 7-8 cm by MARTINI (1979) was based on light microscope investigations and some REM pictures, obviously representing *Gephyrocapsa ericsonii* with bridges broken off, and can be neglected. The calcareous nannoplankton assemblage of this particular sample thus can be placed in standard nannoplankton zone NN 20 (MARTINI 1971, MARTINI & MÜLLER 1986). According to the common occurrence of *Gephyrocapsa ericsonii* MCINTYRE & BE at the position of sample 409-2-1: 7-8 cm can be further narrowed to the upper part of zone NN 20, since *G. ericsonii* occurs first around 300 000 BP well before the first appearance of *E. huxleyi* (BRÉHERET 1978, SAMTLEBEN 1980).

This may lead to some phylogenetic speculations regarding the new species. It is obviously closely related to *Gephyrocapsa ornata* HEIMDAL and to *Emiliana huxleyi* especially to the subspecies *corona* OKADA & MCINTYRE. Both forms have the tendency to build a wall around the central opening, although elements are more toothlike or irregularly curved. However, at present these forms cannot be directly linked with *Emiliana coronata* because lack of information on their stratigraphic ranges. Both were described from modern nannoplankton assemblages, with *G. ornata* also mentioned from the late Pleistocene (Würmian) by SAMTLEBEN (1980). Otherwise only one specimen with somewhat rudimentary dentition on the central part was figured as *Gephyrocapsa ornata* by MÜLLER (1979) from the North Atlantic sample DSDP 403-3-3: 8-9 cm,

placed in the early Pleistocene nannoplankton zone NN 19. On the other hand *Emiliana coronata* so far is only known from the late Pleistocene sample DSDP 409-2-1: 7-8 cm, although samples from around that stratigraphic level from DSDP holes 336, 338, 343 (Norwegian Sea) and 407 (Reykjanes Ridge) were checked for the new species. A peculiar feature in *E. coronata* are the two depressions in the height of the collar arranged diagonally to the long axis of the coccoliths, similar to the position where the bridge of some *Gephyrocapsa* species is situated. *Gephyrocapsa ornata* may represent an evolutionary offspring of *G. ericsonii* already discussed by HEIMDAL (1973) or may belong to a special morphotype within the *G. ericsonii* stock (SAMTLEBEN 1980). This may partially also be true for *Emiliana coronata*, especially if the stratigraphic range of *G. ornata* reaches down to the early Pleistocene. *E. coronata* could have evolved from the *G. ericsonii*/*G. protobuxleyi* stock (for discussion of this group see MCINTYRE 1970 and SAMTLEBEN 1980) via *G. ornata* by developing high elements around the central opening and by loss of the bridge, thus giving rise to the *Emiliana* lineage. But this needs further investigations.

On this occasion a correction for a species provisionally assigned to the genus *Bramletteius* and described from the late Pliocene (nannoplankton zone NN 17) of the Philippine Sea by MARTINI (1980) seems necessary. It obviously belongs to the genus *Gephyrocapsa* because its closely connected shields and its two bridgelike projections. It is transferred herewith: *Gephyrocapsa duoalatus* (MARTINI) nov. comb.

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Plate 2

Fig. 1 *Coccolithus pelagicus* (WALLICH), proximal side.

Fig. 2 *Helicosphaera carteri* (WALLICH), distal side.

Fig. 3 *Cyclococcolithus leptoporus* (MURRAY & BLACKMAN), proximal side.

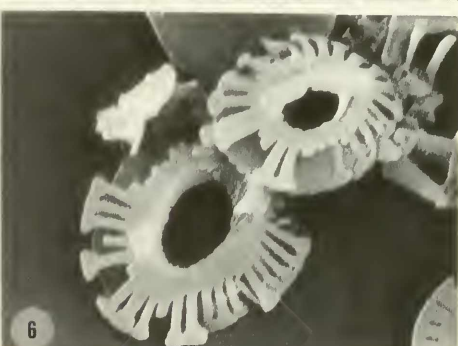
Fig. 4 *Gephyrocapsa oceanica* KAMPTNER, distal side.

Fig. 5-6 *Gephyrocapsa ericsonii* MCINTYRE & BE, distal side. Bridge in lower left specimen of fig. 6 broken off.

Fig. 7 *Coronosphaera mediterranea* (LOHMANN), distal side.

Fig. 8 *Syracosphaera pulchra* LOHMANN, distal side.

All DSDP Leg 49, Sample 409-2-1: 7-8 cm, Pleistocene. Figs. 1 and 3 = REM 3700 x; Fig. 2 = REM 10000 x; Figs. 4-6 = REM 14000 x; Figs. 7 and 8 = REM 11500 x.



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