

## COMMENT

# A new combination coccosphere of the heterococcolith species *Coronosphaera mediterranea* and the holococcolith species *Calyptrolithophora hasleana*

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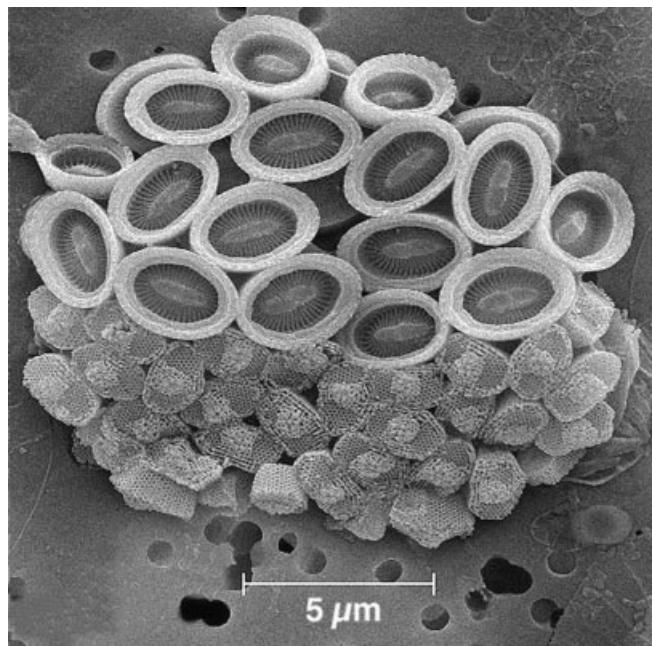
This is the first description of a combination coccosphere of the heterococcolithophore species *Coronosphaera mediterranea* (Lohmann 1902) Gaarder in Gaarder & Heimdal (1977) and the holococcolithophore species *Calyptrolithophora hasleana* (Gaarder 1962) Heimdal in Heimdal & Gaarder (1980) (Figs 1, 2). A single specimen of this new combination coccosphere was found within 53 000 analysed cells in one of 189 samples collected at the JGOFS time series station ALOHA, Hawaii, during 1993 to 1996. The specimen was in a sample collected during autumn 1996 at a water depth of 5 m at a temperature of 26.1 °C, salinity of 35.0 psu, phosphate of 0.002 µmol/kg and in nitrate-depleted water (for details see Cortés, 1998; Cortés *et al.*, 2001).

A combination coccosphere composed of heterococcoliths of *Coronosphaera mediterranea* and holococcoliths of *Calyptrolithina wettsteinii* (Kamptner 1937) Norris (1985) has been reported by Kamptner (1941) and recently confirmed by Cros *et al.* (2000) from the Mediterranean Sea. During the studied time period at the ALOHA time series station these two species accounted for < 1% of the nano-plankton assemblage. No coccospheres composed entirely of *C. wettsteinii* were found in samples which contained *C. mediterranea* and/or *C. hasleana*.

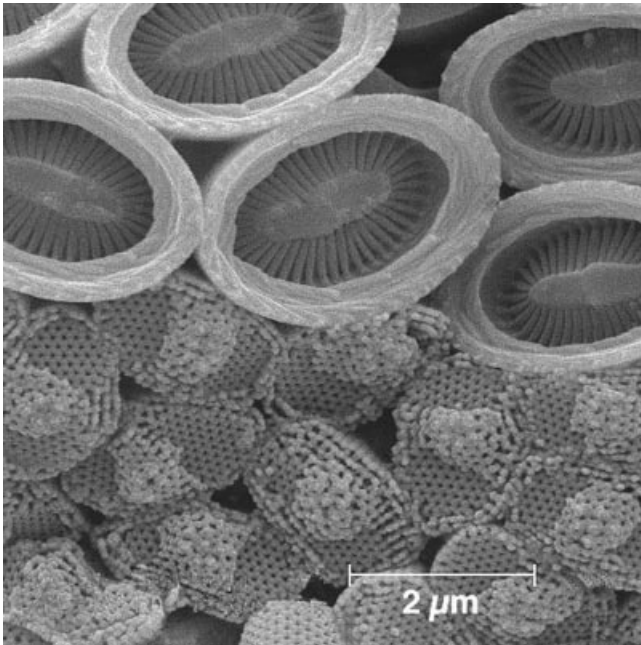
The combination of *Coronosphaera mediterranea* with *Calyptrolithophora hasleana* and *Coronosphaera mediterranea* with *Calyptrolithina*

*wettsteinii* implies that these three taxa belong to the same species. They may represent different stages in a complex life cycle of the same species as already suggested for other taxa (Kleijne, 1991; Cros *et al.*, 2000).

The name *Coronosphaera mediterranea* has priority and is therefore the appropriate name. In addition, Cros *et al.* (2000) have suggested a revision of the nomenclatural taxonomy of hetero- and



**Fig. 1.** Coccosphere of *Coronosphaera mediterranea* with *Calyptrolithophora hasleana*. (Taken with a Philips XL30 scanning electron microscope at the Geological Institute of the ETH Zurich.)



**Fig. 2.** Detail of the same coccosphere as shown in Fig. 1. (Taken with a Philips XL30 scanning electron microscope at the Geological Institute of the ETH Zurich.)

holococcolith associations. According to their proposal, we suggest the following names for the heterococcolith-bearing and the two holococcolith-bearing phases of this species: *Coronosphaera mediterranea* (Lohmann 1902) Gaarder in Gaarder & Heimdal (1977), *Coronosphaera mediterranea* HO wettsteinii and *Coronosphaera mediterranea* HO hasleana.

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## References

- CORTÉS, M., BOLLMANN, J. & THIERSTEIN, H. R. (2001). Coccolithophore ecology at the HOT station ALOHA, Hawaii. *Deep-Sea Res. II.*, **48**: 1957–1981.
- CORTÉS, M. (1998). Coccolithophores at the time-series station ALOHA, Hawaii: population dynamics and ecology. Unpublished PhD dissertation, University of Zurich. 176pp.
- CROS, L., KLEIJNE, A., ZELTNER, A., BILLARD, C. & YOUNG, J. (2000). New examples of holococcolith-heterococcolith combination coccospheres and their implication for coccolithophorid biology. *Mar. Micropaleontol.*, **39**: 1–34.
- GAARDER, K. R. (1962). Electron microscope studies on holococcolithophorids. *Nytt. Mag. Bot.*, **10**: 35–51.
- GAARDER, K. R. & HEIMDAL, B. R. (1977). A revision of the genus *Syracosphaera* Lohmann (Coccolithineae). *Meteor Forschungsergebnisse, Ser. D.*, **24**: 54–71.
- HEIMDAL, B. R. & GAARDER, K. R. (1980). Coccolithophorids from the northern part of the eastern central Atlantic. I. Holococcolithophorids. *Meteor Forschungsergebnisse, Ser. D.*, **32**: 1–14.
- KAMPTNER, E. (1937). Neue und bemerkenswerte Coccolithineen aus dem Mittelmeer. *Arch. Protistenkd.*, **89**: 219–316.
- KAMPTNER, E. (1941). Die Coccolithineen der Südwestküste von Istrien. *Ann. Naturhist. Mus. Wien.*, **51**: 54–149.
- KLEIJNE, A. (1991). Holococcolithophores from the Indian Ocean, Red Sea, Mediterranean Sea and North Atlantic Ocean. *Mar. Micropaleontol.*, **17**: 1–76.
- LOHMANN, H. (1902). Die Coccolithophoridae. *Arch. Protistenkd.*, **1**: 89–165.
- NORRIS, R. E. (1985). Indian Ocean nanoplankton. II. Holococcolithophorids (Calyptosphaeraceae, Prymnesiophyceae) with a review of extant genera. *J. Phycol.*, **21**: 619–641.