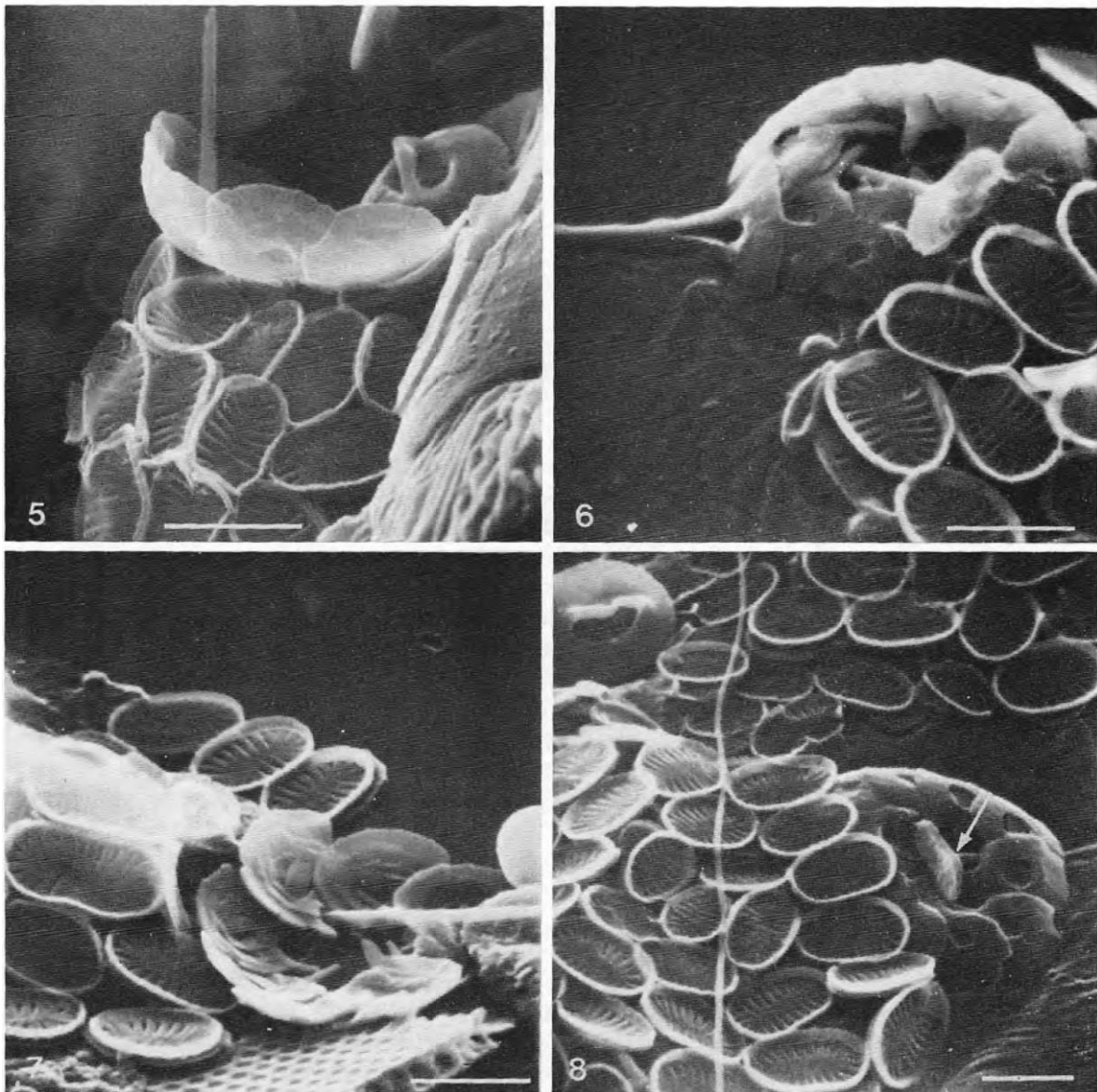


*Calciopappus rigidus* Heimdal in Heimdal & Gaarder (1981)



Pl. 2, Figs 5-8.

Plate 2. Figs 5-8. *Calciopappus rigidus*, SEM. Fig. 5. Holotype. Fig. 6. Whorl and base of apical spine in proximal view. Fig. 7. Whorl coccoliths in distal view, note finger-like projections and central flat bands. Fig. 8. Disintegrated coccolith case, stomatal coccolith (arrow) in oblique proximal view. Scale bar, LM = 10  $\mu$ m, SEM & TEM = 1  $\mu$ m

**Derivation of specific name:** *L. rigidus*, stiff, inflexible; with reference to the stiff, cone-shaped coccolith case.

**Number of specimens studied:** About 50 more or less complete coccolith cases.

**Diagnosis:** Coccolith case stiff, slender, cone-shaped, tetramorphic including appendage. Ordinary coccoliths elliptical, incomplete cancoliths arranged in co-axial rings, long

axis running parallel to long axis of cell. Size ranges from 1.0 to 1.6  $\mu\text{m}$  in length, length/breadth ratio 1.4–1.8. Central area formed of 16-25 flat lamellae arranged at approximately right angles to elliptical outline of coccolith and solid flat central part. An apically placed whorl of subcircular, overlapping coccoliths with central opening partly filled by one or more flat bands, and each with finger-like projection toward centre of whorl. In between these projections a third coccolith type with basic structure as in ordinary ones and a central rod of considerable length. A fourth coccolith type with bayonet-like distal pan and split base with flattened appendage attached to proximal side of whorl coccoliths.

**Holotype:** Negatives EMB, d 5669–d 5671.

**Type locality:** Atlantic Ocean (26° 25.0' N–25° 48.5' N, 14° 43.0' W–15° 33.0' W).

Testa coccolithica tetramorpha, praeter spinas conica, angusta, rigida. Coccolithi ordinarii canelithos imperfectos ellipticos constituentes in circulos coaxiales ordinatos, axibus longitudinalibus cum axe longitudinali cellulae parallelis, 1.0-1.6  $\mu\text{m}$  longos, ratione longitudinis pro latitudine 1.4-1.8. Discus pro parte majore ex 16-25 lamellis complanatis formatus sub angulis subrectis cum margine elliptico et cum lamina centrali solida plana conjunctis. Coccolithi secundi typi in coronam ordinati, suborbiculares, orbibus sese tegentes, area centrali cujusque una vel pluribus vittis complanatis partim expleta, margine ad centrum coronae versus in appendicem digitiformem producto. Area a corona circumvallata partim his digitulis tecta partim coccolithis tertii typi, ordinario- rum praeter bacula centralia satis longa similibus. Coccolithi quarti typi spinas longas constituentes mucronibus excentricis terminatas, basi partitas, appendicibus complanatis coronae subtus affixi.

**Holotypus:** Imagines negativae EMB, d 5669–d 5671.

**Habitatio typi:** Mare Atlanticum (lat. bor. 26° 25.0'–25° 48.5', long. occ. 14° 43.0'–15° 33.0').

**remarks:** No complete coccolith case has been observed in the Rossbreiten material. The attachment to the cell of the coccoliths bordering the apical area and the connections between these seem to be rather loose. The cells were often found without the whorl coccoliths, and each sample in which this species was represented also contained single spines and detached whorls.

The ordinary coccoliths of the new species differ from those of the type, *Calciopappus caudatus* GAARDER & RAMSFJELL, in being smaller and having a lower number of central lamellae running at nearly right angles to the elliptical outline of the coccolith. In most of the ordinary coccoliths examined of *C. caudatus*, the central lamellae run somewhat obliquely to the nearly straight sides of the coccoliths (GAARDER et al. 1954, NISHIDA 1979, pl. 10, fig. 1). As already pointed out by the authors, this may be due to a disarrangement during the isolation process.

The apical spines resemble those of the type, while the shape of the whorl coccoliths appeared to be different. In the transmission electron micrographs presented by GAARDER et al. (1954) the whorl of *C. caudatus* was, however, partially obscured by overlying coccoliths. Recent observations by NISHIDA (1979, pl. 10, fig. 1b) illustrate that the architecture of the whorl coccoliths of *C. caudatus* and *C. rigidus* are almost identical.

In contrast to *C. rigidus*, the *C. caudatus* specimens so far examined seem to lack the helatiform incomplete caneoliths connected with the whorl coccoliths.

The *C. caudatus* specimens studied by GAARDER et al. (1954) were, however, poorly preserved, and it is difficult, on the basis of the transmission electron micrographs, to decide whether more than one kind of coccoliths with a spiny process was present on the cell. But even NISHIDA's seemingly well preserved specimens failed to demonstrate this type of coccolith.

Heimdal, B.R. & Gaarder, K.R., 1981. Coccolithophorids from the northern part of the eastern central Atlantic. II. Heterococcolithophorids. "*Meteor*" *Forschung Ergebnisse, Reihe D*, **33**: 37-69.