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SHORT NOTE – NOTA BREVE

***PSEUDORHOMBODINIUM CINGULOINDENTATUM* GEN. N. SP. N.  
(DINOFLAGELLATA): A NEW ORGANIC-WALLED DINOFLAGELLATE CYST  
FROM THE UPPER EOCENE OF SICILY, ITALY**

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*Key words:* Organic-walled dinoflagellate cysts, new taxon, taxonomy, Upper Eocene, Sicily, Italy.

*Abstract.* The organic-walled dinoflagellate cyst *Pseudorhombodinium cinguloindentatum* gen. n. sp. n. is formally described from the Upper Eocene of Sicily, Italy. It consists of a brown coloured, circumcavate wetzelielloid cyst with marked V-shaped cingular indentations in the pericyst. The proposed generic name refers to similarities existing in the overall morphology with the genus *Rhombodinium* Gocht. However, substantial differences in archeopyle styling, in the disposition of antapical horns, and in the amount of cingular indentation, advocate the erection of the new genus *Pseudorhombodinium*.

*Riassunto.* Viene formalmente descritta la ciste di dinoflagellata a parete organica *Pseudorhombodinium cinguloindentatum* gen. n. sp. n. proveniente dall'Eocene superiore della Sicilia nord-orientale. Si tratta di una ciste wetzelielloide circumcavata, caratterizzata da marcate indentazioni a forma di V nella periciste. Il nome generico qui proposto evoca le somiglianze esistenti nella morfologia complessiva col genere *Rhombodinium* Gocht. Tuttavia, differenze sostanziali nella geometria dell'archoepyle, nella disposizione dei corni anti-apicali e nell'entità di indentazione del *cingulum* nella periciste, giustificano l'erezione del nuovo genere *Pseudorhombodinium*.

## Introduction

Northern Sicily is part of the south-verging branch of the Apennine-Maghrebian mountain range, a segment of the collisional boundary between Africa and Europe. The tectonic pile which forms this mountain range is constituted by structural elements separated by detachment levels. They were emplaced during the Eocene to Early Miocene and re-deformed during

the Late Miocene to Pliocene, yielding plays for the hydrocarbon exploration (Bello et al. 2000).

Since the early 1990s, palynology has been employed by Eni's biostratigraphers as a routine investigative tool to reconstruct the stratigraphy and the stacking patterns of tectono-sedimentary units involved in the Maghrebian chain of Sicily (Fig. 1). In the course of palynological analyses carried out on the sediments penetrated by wells in the Fiumetto gas field, specimens of a remarkable wetzelielloid dinoflagellate cyst, so far unknown, have been detected. They are formally described and illustrated in the present paper.

## Material and methods

The material presented in this study was recovered from marl and shale strata of the Polizzi Formation *sensu* Torricelli & Knezaurek (2010) drilled in the Fiumetto gas field, Sicily (Fig. 1). Ditch cuttings were prepared for palynological analyses following a standard processing procedure involving cold chemical treatment with 37% hydrochloric acid to remove the calcareous fraction and with 38% hydrofluoric acid to remove the silicates, sieving with 250 µm and 15 µm nylon meshes, heavy liquid separation using ZnCl<sub>2</sub> and centrifuging (1250 r.p.m. for 5 minutes) to concentrate the residue. After each step the residue was washed in distilled water and no oxidation was performed. The organic residue sized between 250 µm and 15 µm was mounted on slides using Norland optical adhesive.

Light photomicrographs were taken with a Zeiss Axioplan microscope and interference-contrast illumination (Pl. 1). For illustrated specimens England Finder coordinates are provided. The material examined in this study is housed in the collections of the Department of Stratigraphy, Eni Exploration & Production, San Donato Milanese, Italy.

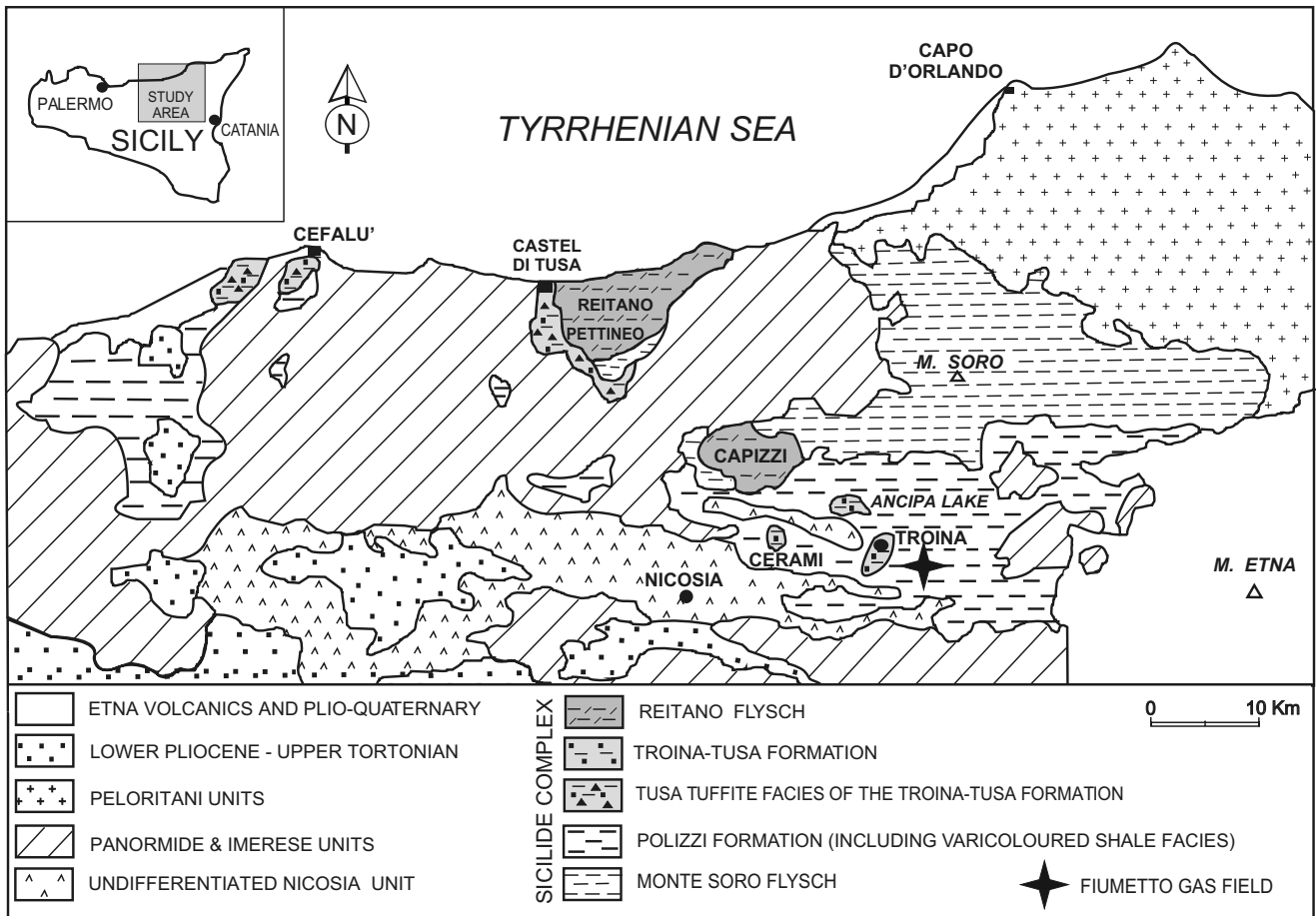


Fig. 1 - Simplified map of tectono-stratigraphic units outcropping in north-eastern Sicily following the concepts discussed by Torricelli & Knezaurek (2010) in the present volume. The asterisk indicates the type locality of *Pseudorhombodinium cinguloindentatum* gen. n. sp. n.

### Systematic Palynology

The systematics follow Fensome et al. (1993), whereas the generic allocation of taxa is referred to Fensome & Williams (2004).

Division **Dinoflagellata** (Bütschli 1885)  
Fensome et al., 1993

Subdivision **Dinokaryota** Fensome et al., 1993

Class **Dinophyceae** Pascher, 1914

Subclass **Peridiniphyceae** Fensome et al., 1993

Order **Peridiniales** Haeckel, 1894

Family Peridiniaceae Ehrenberg, 1831

Subfamily Wetzelielloideae (Vozzhennikova, 1961)  
Bujak & Davies, 1983

*Pseudorhombodinium* gen. n.

Pl. 1, figs 1-9

Type species. *Pseudorhombodinium cinguloindentatum* n. sp.

**Etymology:** Name composed by the Greek suffix 'pseudo' for 'false', and 'rhombodinium', in reference to the resemblance of the new genus with the dinoflagellate cyst genus *Rhombodinium* (Gocht 1955).

**Diagnosis:** Proximate circumcavate wetzelielloid cysts with a pentagonal pericyst ambitus. The endocyst is centred, round to ellipsoidal. The paratabulation is indicated by the rectangular 2a intercalary archeopyle (quadra-style *sensu* Evitt 1985) and periphragmal folds aligned on the cingulum.

**Discussion.** *Pseudorhombodinium* gen. n. is similar to *Rhombodinium* (Gocht 1955) in being a circumcavate wetzelielloid cyst lacking spinate ornamentation and possessing cingular folds on the periphragm. However, a major difference that justifies the erection of the new genus *Pseudorhombodinium* is in the archeopyle, that in *Rhombodinium* is either soleiform, i.e. the operculum is attached to the cyst along the anterior margin of the 2a paraplate (Bujak 1979; Fensome et al. 2009), or trapezoidal (Michoux 1988; Lentin & Vozzhennikova 1989), whereas in *Pseudorhombodinium* gen. n. reflects the loss of a rectangular 2a anterior intercalary paraplate and the operculum is detached along each side, although often in place. Moreover, in *Pseudorhombodinium* the left antapical horn is either slightly longer than the right one or equal, thus resulting in a pentagonal pericyst outline. In contrast, in *Rhombodinium* and *Dracodinium* the right antapical horn is consistently more re-

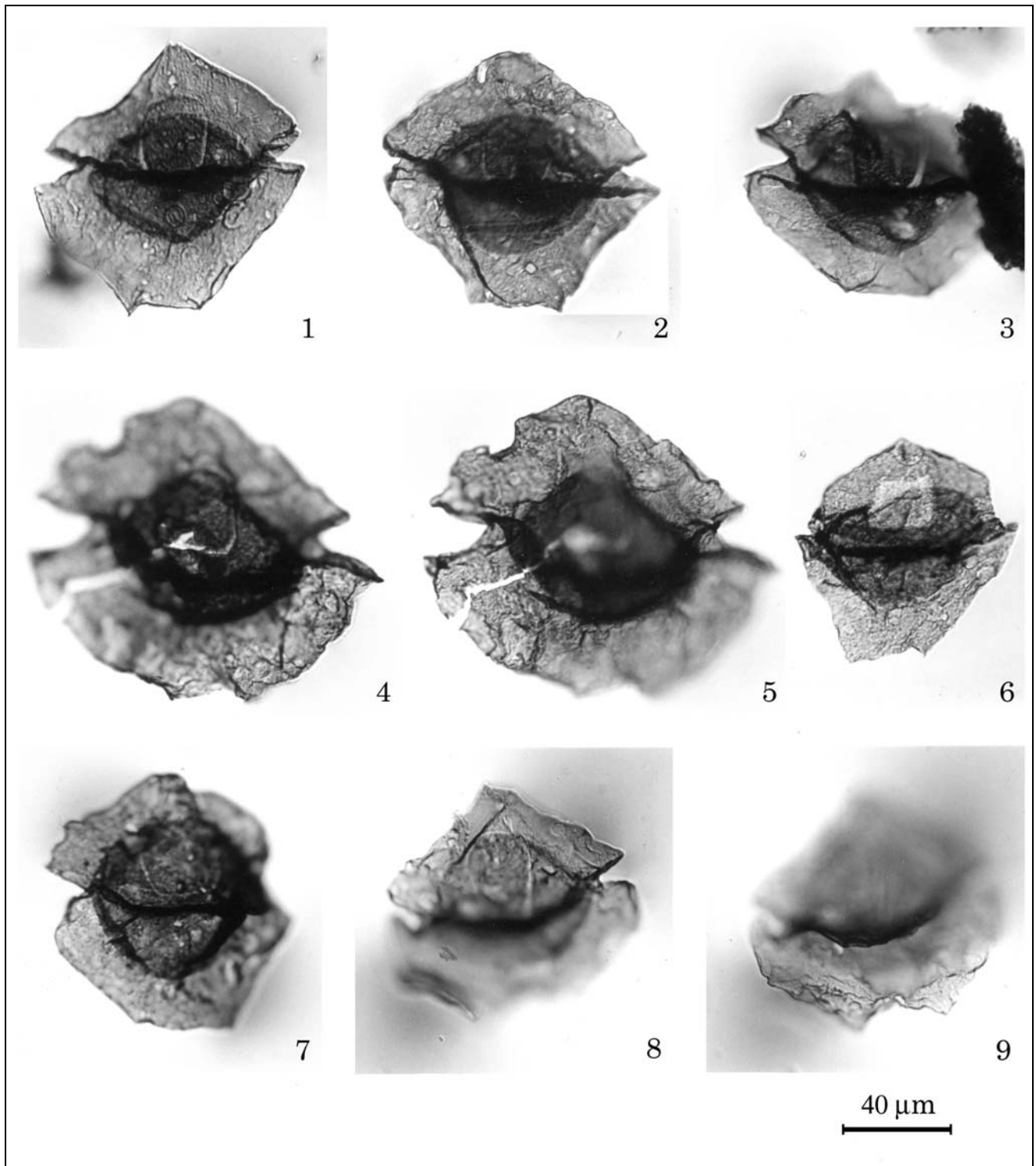


PLATE 1

1-9 - *Pseudorbombodinium cinguloindentatum* Torricelli gen. n. sp. n. Note the quadra-style archeopyle formed by the loss of the rectangular 2a anterior intercalary paraplate and the operculum free, but often in place.

1) slide A22465 England Finder B47/4; 2) slide A34097 England Finder D44, holotype; 3) slide A34070 England Finder Q47/3; 4-5) slide A22399 England Finder M58; 6) slide A25986 England Finder Y36; 7) slide A34092 England Finder F50/4; 8-9) slide A33937 England Finder R49/3.

duced than the left one, thus resulting in a rhomboidal pericyst outline.

**Remarks.** The deep V-shaped lateral indentations in the pericyst characterising the type of *Pseudorhombodinium* gen. n. represent a remarkable diagnostic feature. However, cingular indentations on the lateral horns have been reported also for the genus *Rhombodinium* (Gocht 1955), even though much less incised than in *Pseudorhombodinium cinguloindentatum* n. sp.

***Pseudorhombodinium cinguloindentatum* gen. n. sp. n.**

Pl. 1, figs 1-9

**Etymology:** Name composed by the term ‘cingulum’ and the Latin adjective ‘indentatum’, with reference to the deep V-shaped lateral indentations in the periphragm.

**Holotype:** Plate 1 (Fig. 2), Slide A34097, England Finder D 44. Pericyst length = 94 µm; pericyst breadth = 102 µm; endocyst length = 50 µm; endocyst breadth = 61 µm.

**Type-locality and horizon:** Well Fiumetto 4D, Fiumetto di Troina Valley, Sicily, Italy. Polizzi Formation, sample depth 920 m, cutting sample.

**Repository:** Palynological slide collection, department of stratigraphy, Eni Exploration & Production, San Donato Milanese, Italy.

**Description.** Large to medium sized brown coloured organic walled cysts, circumcavate. The pericyst ambitus is pentagonal. Both the apical and the two antapical horns are poorly developed, mostly rounded the apical and pointed the antapicals. The internal angle of the apical horn is obtuse. Antapical horns are almost equal; sometimes the left antapical horn can be slightly longer and more tapered than the right one. Two reduced and equal lateral horns are characterised by a deep V-shaped cingular indentation. The periphragm ornamentation is scabrate. The endophragm is centred, round to ellipsoidal, much smaller than the periphragm,

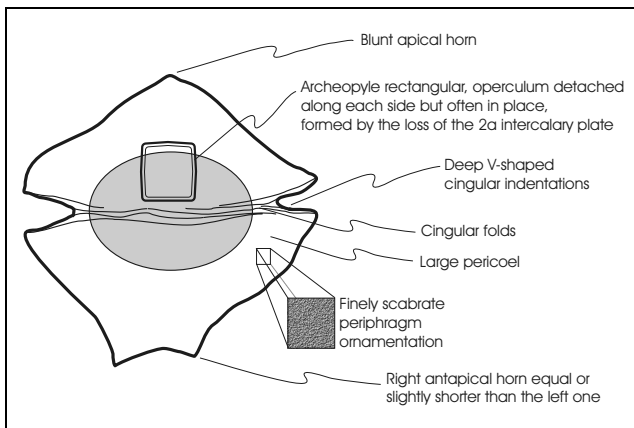


Fig. 2 - Schematic illustration of *Pseudorhombodinium cinguloindentatum* gen. n. sp. n. with a summary of the most diagnostic features.

hence the pericoel is wide and well developed. The archeopyle is formed by the loss of the rectangular 2a anterior intercalary paraplate. Following Evitt (1985), this is a quadra-style intercalary archeopyle. It has been observed only on the periphragm, not on the endophragm. The operculum is well defined and clearly detached from the cyst along each side, although often still in place. Other evidences of paratabulation consist in periphragmal folds in correspondence of the cingulum. These diagnostic features are summarised in Fig. 2.

**Dimensions.** Pericyst length = 82-112 µm; pericyst breadth = 83-130 µm; endocyst length = 42-60 µm; endocyst breadth = 56-70 µm. Eleven specimens measured.

**Remarks.** The deep V-shaped lateral indentations in the pericyst are very distinctive features of this species. In some specimens the periphragm is broken in correspondence of the cingular indentations, probably as a response to the compression of the cyst due to sediment load and compaction.

**Stratigraphic occurrence.** Specimens of *Pseudorhombodinium cinguloindentatum* gen. n. sp. n. have been recovered in Sicily (southern Italy) from Eocene sediments referable to the Polizzi Formation *sensu* Torricelli & Knezaurek (2010). Both the name and age of this lithostratigraphic unit have been much debated in the literature and despite a general agreement that micro-, nanno- and palynofossils are typically Eocene to earliest Oligocene in age, some geoscientists claimed that these fossils were reworked during the deformation of the Maghrebian mountain range and recycled within Early Miocene turbidites. However, no firm Miocene fossils have ever been consistently documented from this formation. By contrast, the Eocene-earliest Oligocene age of this formation is now confirmed by new data (for a comprehensive discussion see Torricelli & Knezaurek 2010). In the palynological preparations analysed in this study, Eocene dinoflagellate cysts are common and diverse and include the Late Eocene index-species *Schematophora speciosa* and *Hemiplacophora semilunifera*, whereas no exclusively Oligocene or younger taxa in the sense of Williams et al. (2004) are actually present. Therefore, considering also that all other members of the subfamily Wetzelielloideae are known as fossils from marine strata of Paleogene age (Fensome et al. 1993), it can reasonably be concluded that the original stratigraphic distribution of *P. cinguloindentatum* gen. n. sp. n. is in the Upper Eocene.

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