

Foam events due to a *Phaeocystis* bloom along the Catalan Coast (NW Mediterranean)

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INTRODUCTION

Coastal blooms of marine haptophytes of the genus *Phaeocystis* are frequently associated with extensive masses of foam, causing problems for local fishing activities and tourist industries. On March 2006, a *Phaeocystis* bloom occurred along the central coast of Catalonia (NE Spain; Fig. 1). Organisms of this genus have previously been recorded along this coast, but not at such high densities. In this occasion, the abundance of cells was high enough to produce visible amounts of foam, covering several kilometers of coastline.

FOAM OBSERVATIONS



Fig. 1 – Location of the beaches where foams were observed.

Foams were first detected on **March, 19** by the five ARGUS video cameras focusing on the **Barcelona city coast** (Fig. 1 and 2). These cameras monitor the area since 2001, and water samples are regularly collected (usually once a month) at 8 stations (Fig. 2). Three days prior to foam detection (on March, 16) samples showed a very dense *Phaeocystis globosa* population (Table 1).

Table 1 – Concentration of *Phaeocystis* cells at sites where formation of foam was observed.

Beach	Date (dd-mm-yy)	<i>Phaeocystis</i> (cells L ⁻¹)
Barcelona	16-03-06	0.77 * 10 ⁶
Cabrera	27-03-06	15.4 * 10 ⁶
Mataró	27-03-06	11.0 * 10 ⁶
		19.1 * 10 ⁶ (foam)
St. Andreu de Lliavaneres	27-03-06	8.18 * 10 ⁶
Cavalló	27-03-06	5.94 * 10 ⁶



Fig. 3 – Foams at the Mataró beach.

On **March, 27** the Harmful Monitoring Program (focusing on harmful and noxious species along the Catalan coast) detected the presence of **foam** at several beaches located along approximately **40 km** shoreline extending from **Barcelona to the north** (Fig. 1 and 3). Analysis of water samples and foam revealed the presence of more than **5 * 10⁶ *Phaeocystis globosa*** cells per liter (Table 1).

This was the first time that the presence of foam along the Catalan coast was attributed to *Phaeocystis globosa*, and it comprised the first relevant phytoplankton event recorded by the ARGUS video cameras installed in this zone.

COASTAL MONITORING STATION OF BARCELONA



Fig. 2 - Photograph of the Barcelona coast realized with an ARGUS video camera system on March, 19 showing the presence of foams. Location of the 8 sampling stations is indicated by red points.

Hydrography and phytoplankton composition before, during and after the bloom

Table 2 - Statistics (from 8 stations) for surface date of hydrochemical variables and Chl a (Mean ± SE).

	Before	During	After
Date (dd-mm-yy)	26-01-06	16-03-06	27-04-06
Temperature	12.48 ± 0.06	12.54 ± 0.10	16.16 ± 0.24
Salinity	38.32 ± 0.01	38.18 ± 0.09	38.00 ± 0.04
PO ₄ (µM)	0.12 ± 0.02	0.32 ± 0.09	0.17 ± 0.04
NH ₄ (µM)	1.56 ± 0.30	4.86 ± 2.43	4.82 ± 1.21
NO ₃ (µM)	1.08 ± 0.10	0.40 ± 0.14	0.49 ± 0.14
NO ₂ (µM)	1.94 ± 0.14	2.92 ± 0.51	0.56 ± 0.13
H ₂ SiO ₄ (µM)	1.77 ± 0.09	1.83 ± 0.40	1.25 ± 0.21
Chl a (µg l ⁻¹)	0.88 ± 0.04	2.23 ± 0.07	0.64 ± 0.09

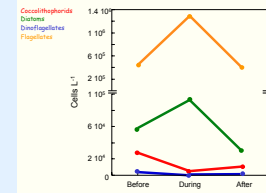


Fig. 4 - Main phytoplankton groups at surface (St. A). Note the different scale for flagellates.

Flagellates and diatoms were the most abundant organisms **before, during and after** the bloom of *Phaeocystis*, with maximum abundances during the bloom (flagellates = 92.9% and diatoms = 6.7% of the total phytoplankton; Fig. 4 and 5). *Phaeocystis globosa* comprised **60%** of the **flagellates** during the bloom, but was not detected in samples collected before. The diatom population found during the bloom mainly (98%) consisted of chain-forming species (Fig. 5). Physical and chemical variables observed during the sampling period are shown in Table 2.

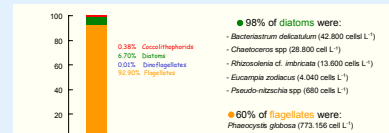


Fig. 5 - Phytoplankton composition at surface during the bloom (St. A).

PHAEOCYSTIS GLOBOSA

Based on the observed **morphology** of the colonies these organisms were identified as *Phaeocystis globosa*. Most of the organisms were present in colonies (with non-flagellate cells; Fig. 6). However, free-living flagellate and non-flagellate organisms were also found (Fig. 7).

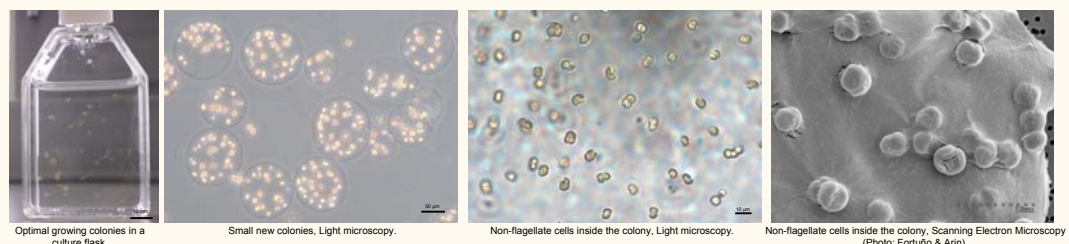


Fig. 6 - *P. globosa* colonies observed at different magnifications.

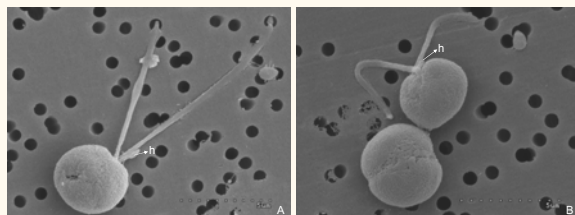
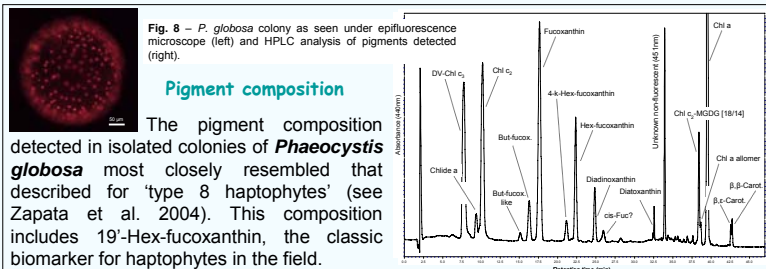
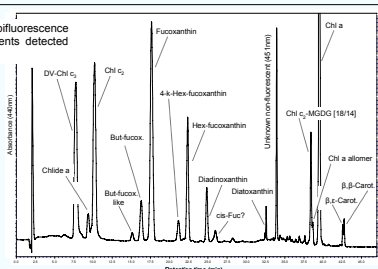


Fig. 7 - Free flagellate cells (A and B) with flagella and haptonema (h), and a free non-flagellate cell (B). Scanning Electron microscopy (Photo: Fortuño & Arin).



Pigment composition

The pigment composition detected in isolated colonies of *Phaeocystis globosa* most closely resembled that described for 'type 8 haptophytes' (see Zapata et al. 2004). This composition includes 19'-Hex-fucoxanthin, the classic biomarker for haptophytes in the field.



REFERENCES

Zapata et al. (2004) Mar. Ecol. Prog. Ser 270:83-102

ACKNOWLEDGEMENT

-To M. Lloret & E. Ojeda for their help.
-To PUDEM (REN2003-06637-C02) and the Catalan Water Agency.