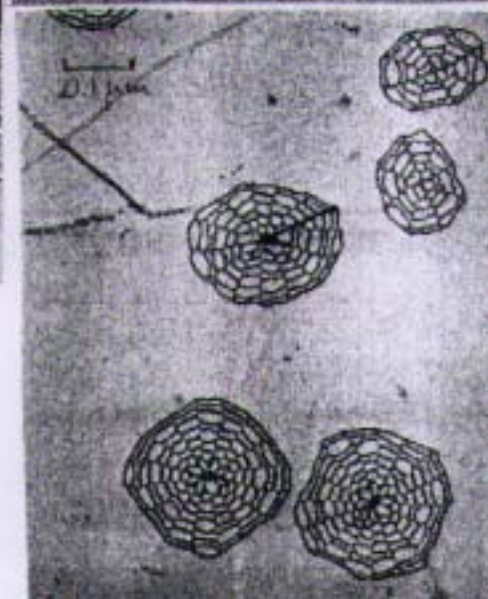
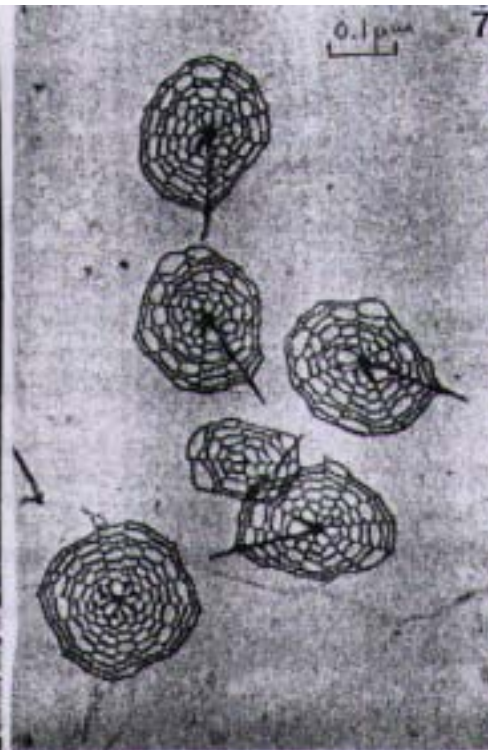


# **Diversity of picoplanktonic Prasinophytes**

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Institut de Ciències del Mar  
Barcelona, Spain



**Mamiellales :**

*Mamiella gilva*

In : Moestrup, 1984,  
Nord.J. Bot. 4 : 109-121

## **A controversial taxonomy...**

- Prasinophycinées Chadeffaud, 1960
- Prasinophyceae sensu Christensen, 1962
- Prasinophyceae sensu Norris, 1980
- Micromonadophyceae sensu Mattox et Stewart, 1984
- Prasinophyceae sensu Moestrup et Thronsen, 1988
- Prasinophyceae sensu Sym et Pienaar, 1993
- Micromonadophytes in Lecointre et Le Guyader, 2001

**To be continued.....**

## Morphological deviation....

Lost of the scales



*Micromonas pusilla*

Lost of the flagella



*Bathycoccus prasinos*

## Mamiellales

Lost of both of them!!!



*Ostreococcus tauri*

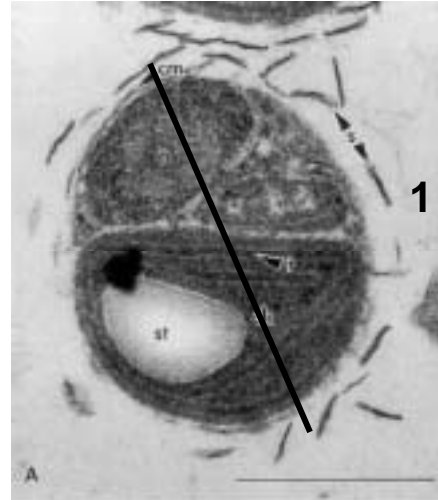
## Champions for their small size...

1 - 3  $\mu\text{m}$



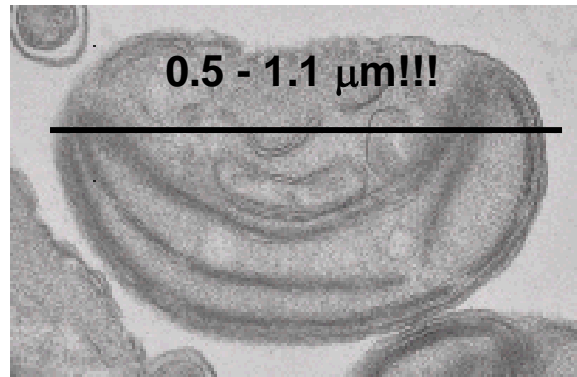
*Micromonas pusilla*

1 - 2.5  $\mu\text{m}$



*Bathycoccus prasinos*

0.5 - 1.1  $\mu\text{m}$ !!!



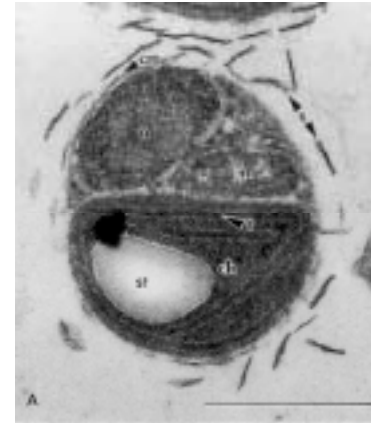
*Ostreococcus tauri*

# Direct observations of natural samples by electronic microscopy

***Micromonas*-like**

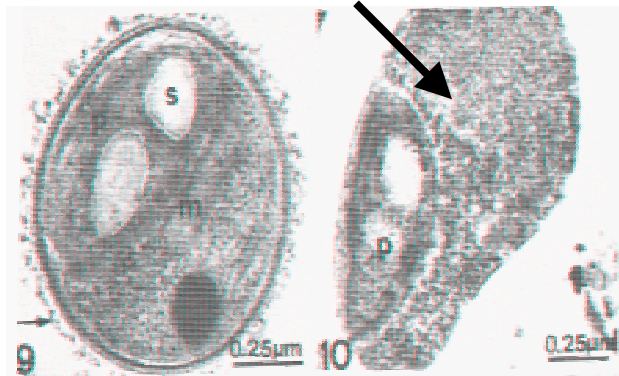


***Bathycoccus*-like**



**Western North Atlantic Ocean**  
(Johnson et Sieburth 1982)

***Ostreococcus*-like**



**Lagoon**  
(Andreoli et al. 1989)

***Chlorella*-like**



**Western North Pacific Ocean**  
(Takahashi et Hori 1984)

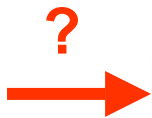
**Celtic Sea**  
(Joint et pipe 1984)

Table 5. Estimates of the contributions of algal classes and cyanobacteria to chlorophyll a in the four study areas

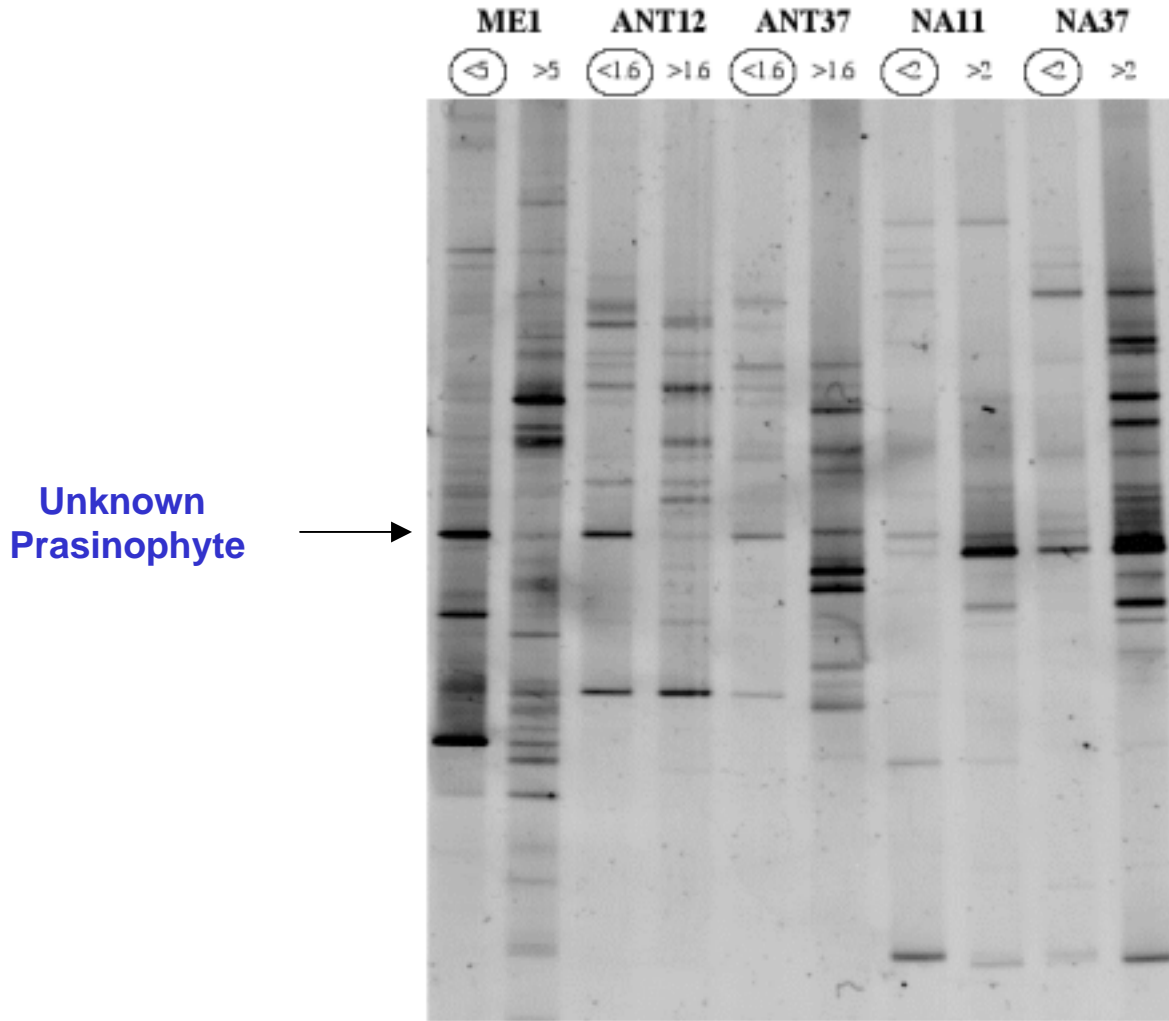
Class	Seawater samples*											
	Group A			Group B			Group C			20 m	Group D	
Stations	T1	T2	T3	T4	T6	T7	T9	T10	T11A	T11B	T12	T13
Dinoflagellates	20	18	6	9	9	10	2	0	3	4	7	8
Cryptophytes	0	0	0	0	0	0	0	0	3	1	1	0
Prasinophytes	4	2	0	5	5	3	6	6	10	0	7	4
Other greens	31	79	40	20	7	21	0	66	12	12‡	9	9
Diatoms	9	0	1	2	3	6	14	15	13	5	5	4
Prymnesiophytes	43	14	30	36	16	33	45	52	21	7	11	12
Prochlorophytes	0	0	2	19	11	21	7	0	9	5	9	8
Cyanobacteria	1	0	1	27	35	12	4	2	1	32	23	17
Total† (%)	108	113	80	118	86	106	78	141	72	65	72	62

\* A, equator at 150°E; B, equator between 143°E and 148°E; C, off the coast of Papua New Guinea; D, Coral Sea.

**Western equatorial Pacific**  
(Everitt et al. 1990)



# DGGE

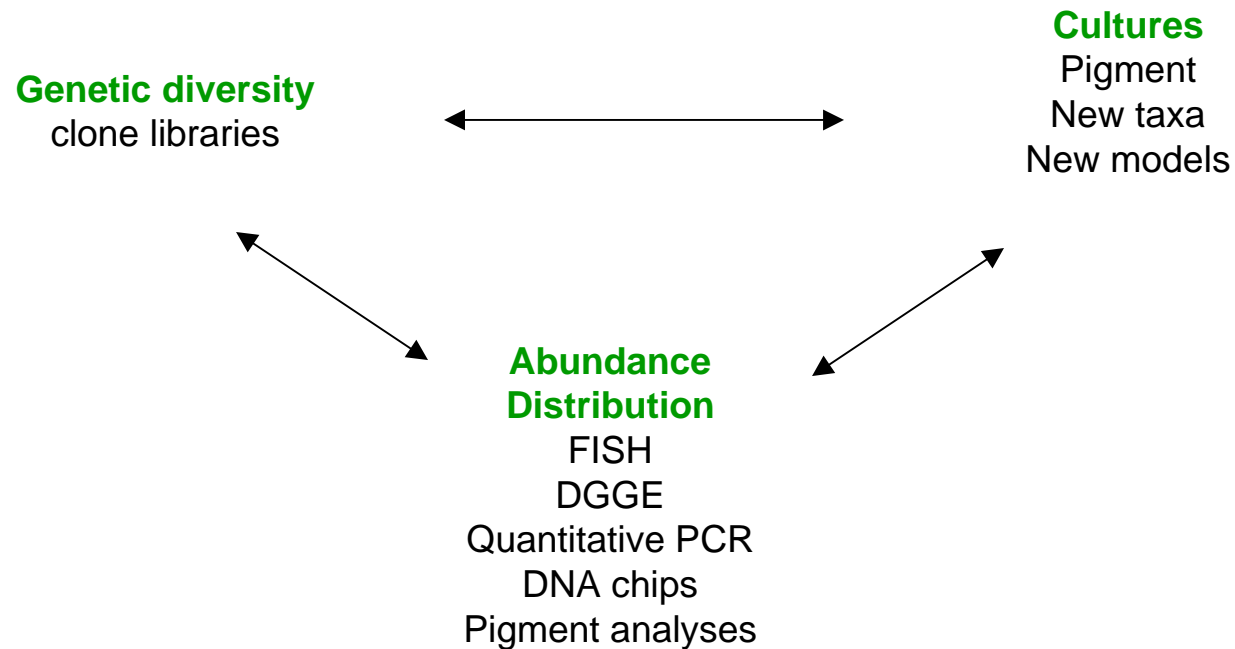


→ Dominance of a tiny Prasinophyte in very different oceanic waters

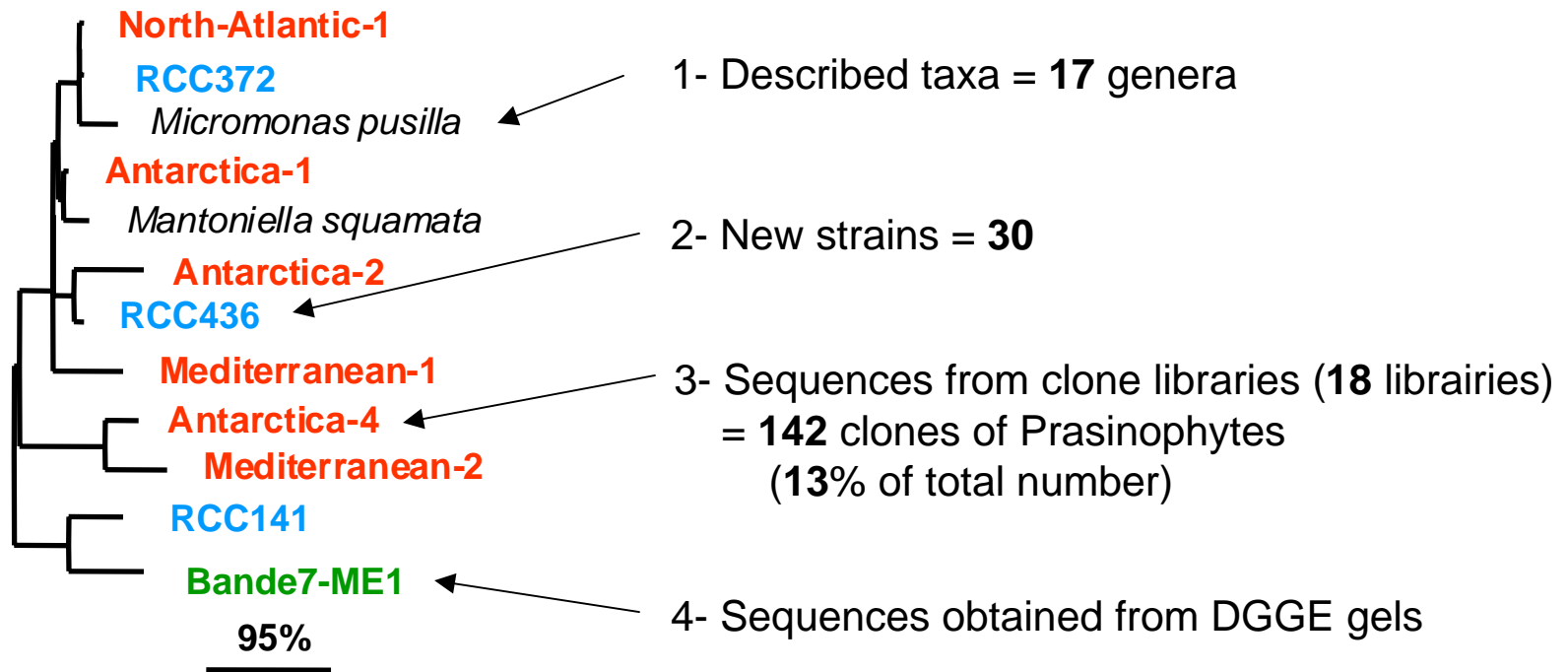
# PICODIV

European Project EVK3-CT-1999-00021

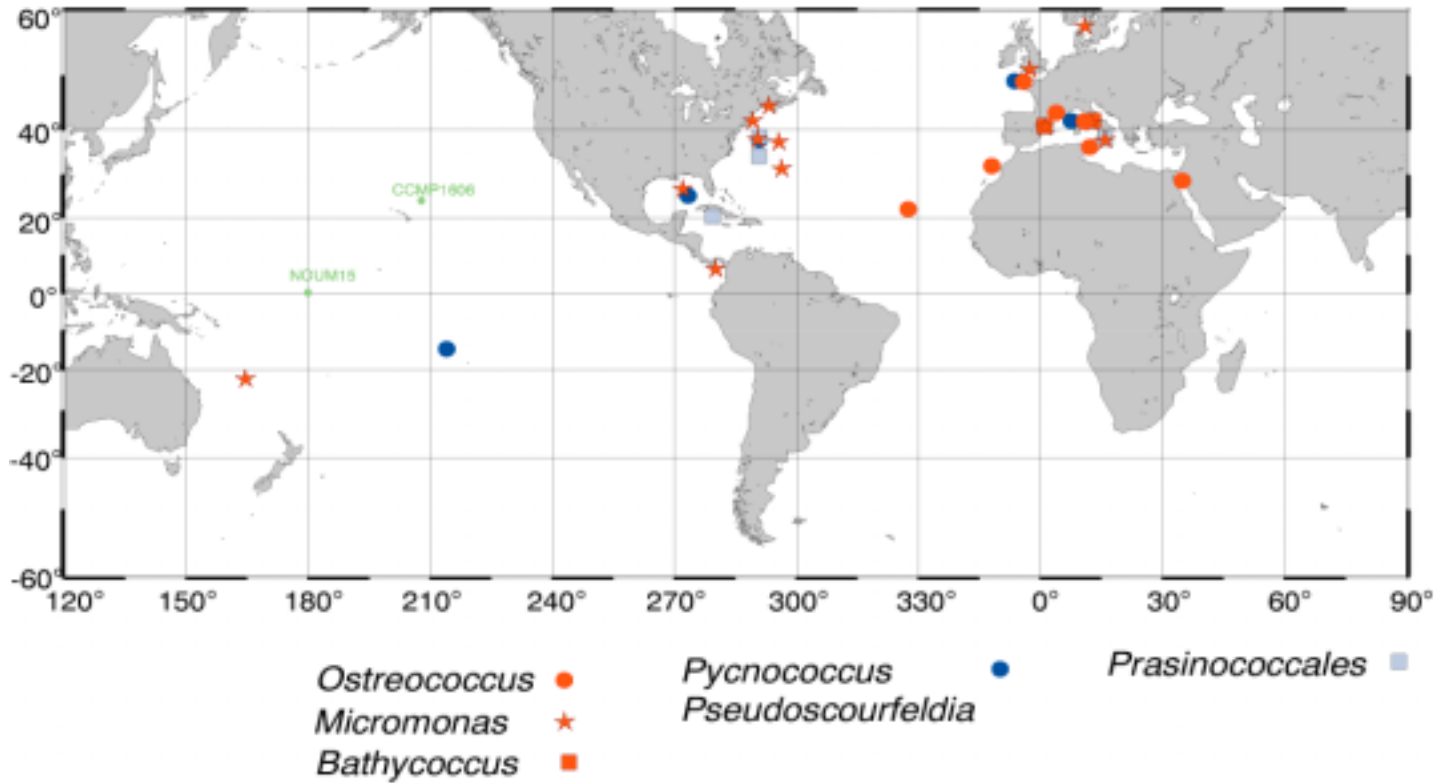
## Monitoring the diversity of photosynthetic picoplankton in marine waters



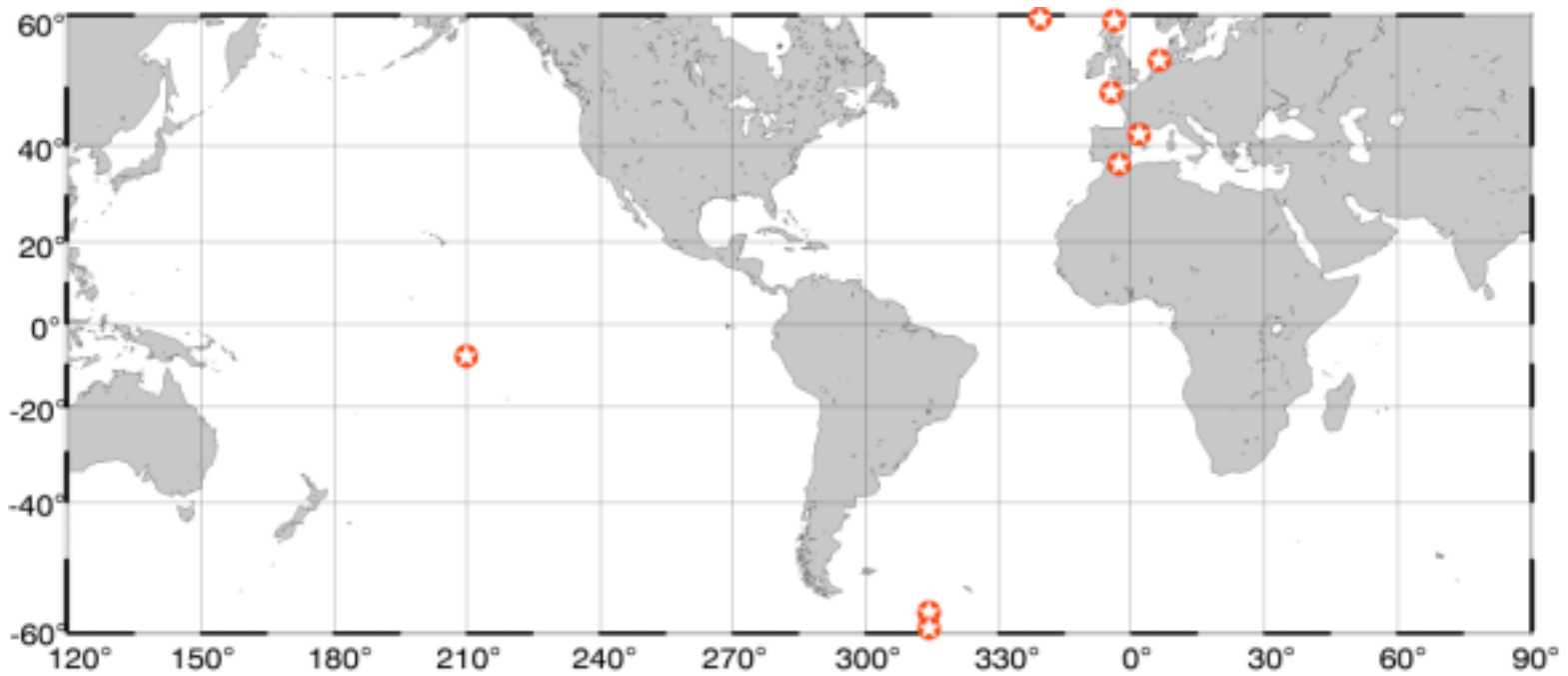
## Genetic diversity of Prasinophytes



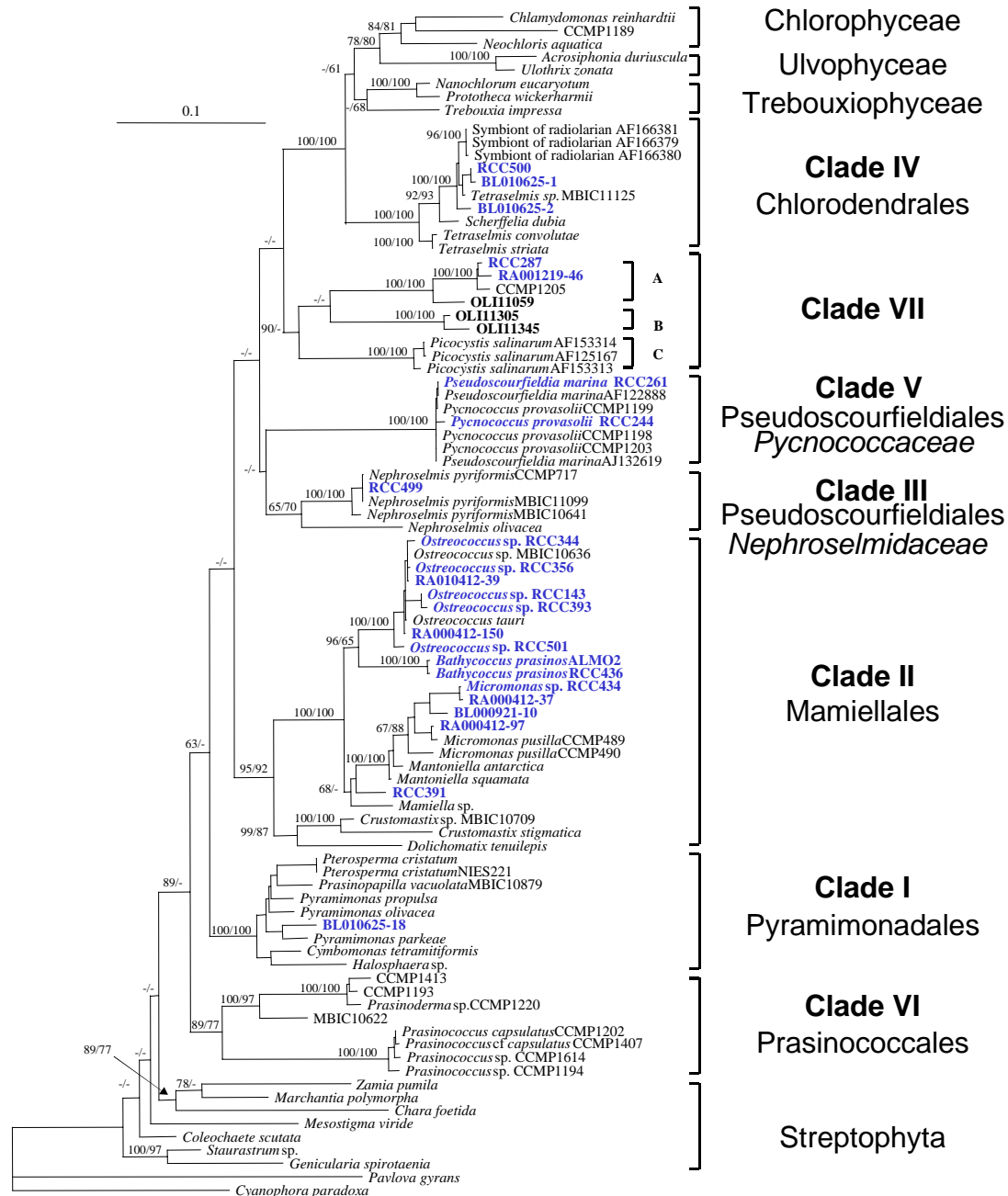
## Origin of Prasinophyte cultures



## Clone libraries (18)



		Number of clones	Mamiellales		Other Prasinophyceae	
			↓	↙		Other green algae
		↘	↓	↙		↓
ME1	Mediterranean Sea, Alboran	64	16	-	25 %	-
ANT37	Antarctica, Weddel Sea	58	19	-	33 %	-
ANT12	Antarctica, Scotia Sea	67	8	-	12 %	-
NA11	North Atlantic	17	1	-	6 %	-
NA37	North Atlantic	20	2	-	10 %	-
OLI11_75m	Equatorial Pacific	101	-	3	3 %	-
	<b>Total oceanic site</b>	<b>327</b>	<b>46</b>	<b>3</b>	<b>15 %</b>	<b>-</b>
BL000921	Mediterranean Sea, Blanes	78	2	-	2 %	-
BL001221	Mediterranean Sea, Blanes	112	8	-	7 %	2
BL010320	Mediterranean Sea, Blanes	88	4	-	4 %	1
BL010625	Mediterranean Sea, Blanes	106	-	21	20 %	5
RA000412	English Channel, Roscoff, Astan	108	21	-	19 %	-
RA000609	English Channel, Roscoff, Astan	47	4	-	8 %	-
RA000907	English Channel, Roscoff, Astan	49	4	1	10 %	-
RA001219	English Channel, Roscoff, Astan	46	4	2	13 %	-
RA010412	English Channel, Roscoff, Astan	49	12	-	24 %	-
RA010516	English Channel, Roscoff, Astan	48	13	-	27 %	-
RA010613	English Channel, Roscoff, Astan	47	5	1	13 %	-
	<b>Total coastal site</b>	<b>778</b>	<b>77</b>	<b>25</b>	<b>13%</b>	<b>8</b>
RD010517	English Channel, Roscoff, Dourduff	43	8	-	19 %	-
	<b>Total estuarine site</b>	<b>43</b>	<b>8</b>	<b>-</b>	<b>19%</b>	<b>-</b>
	<b>TOTAL for all libraries</b>	<b>1148</b>	<b>131</b>	<b>28</b>	<b>14 %</b>	<b>8</b>

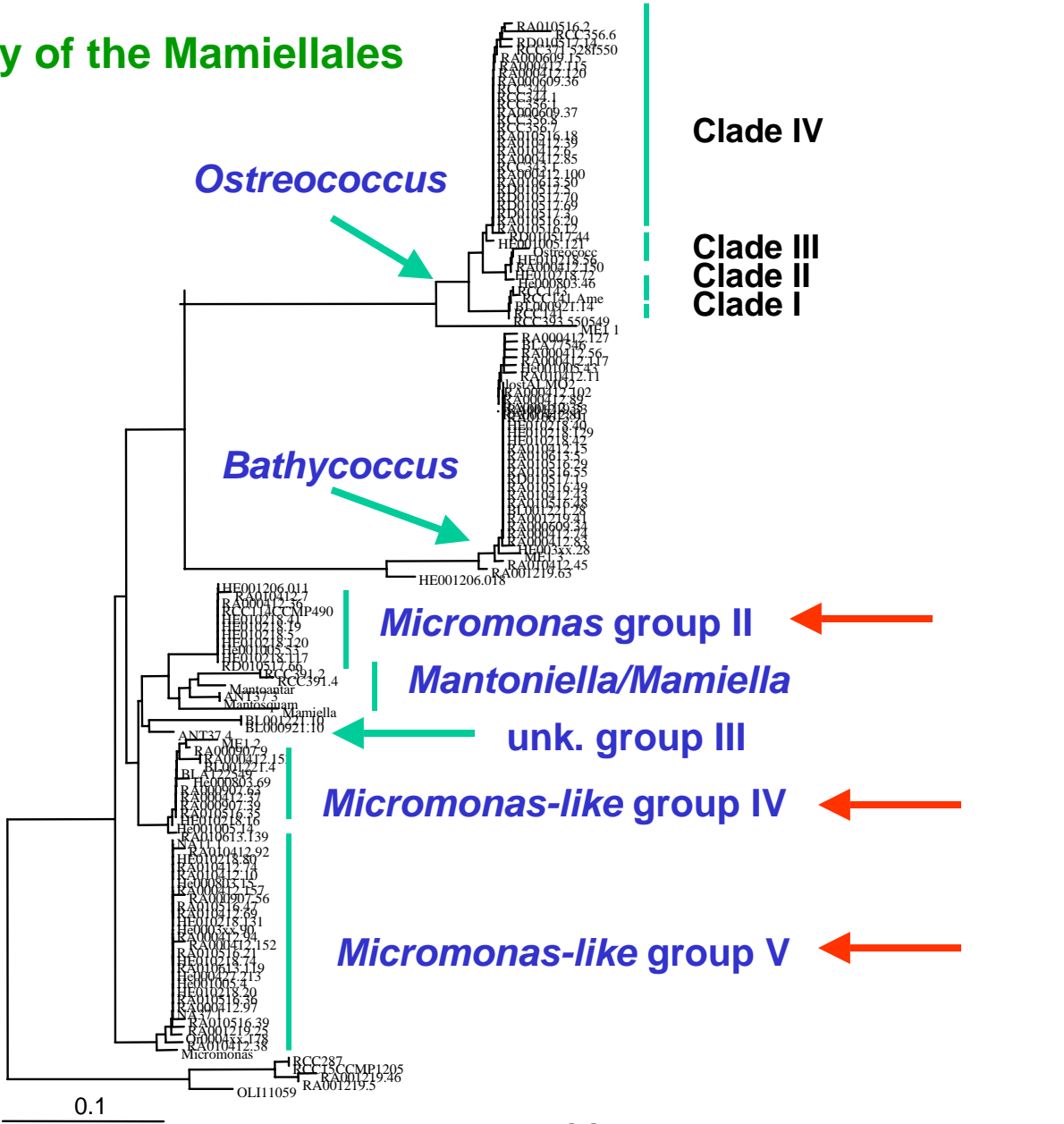


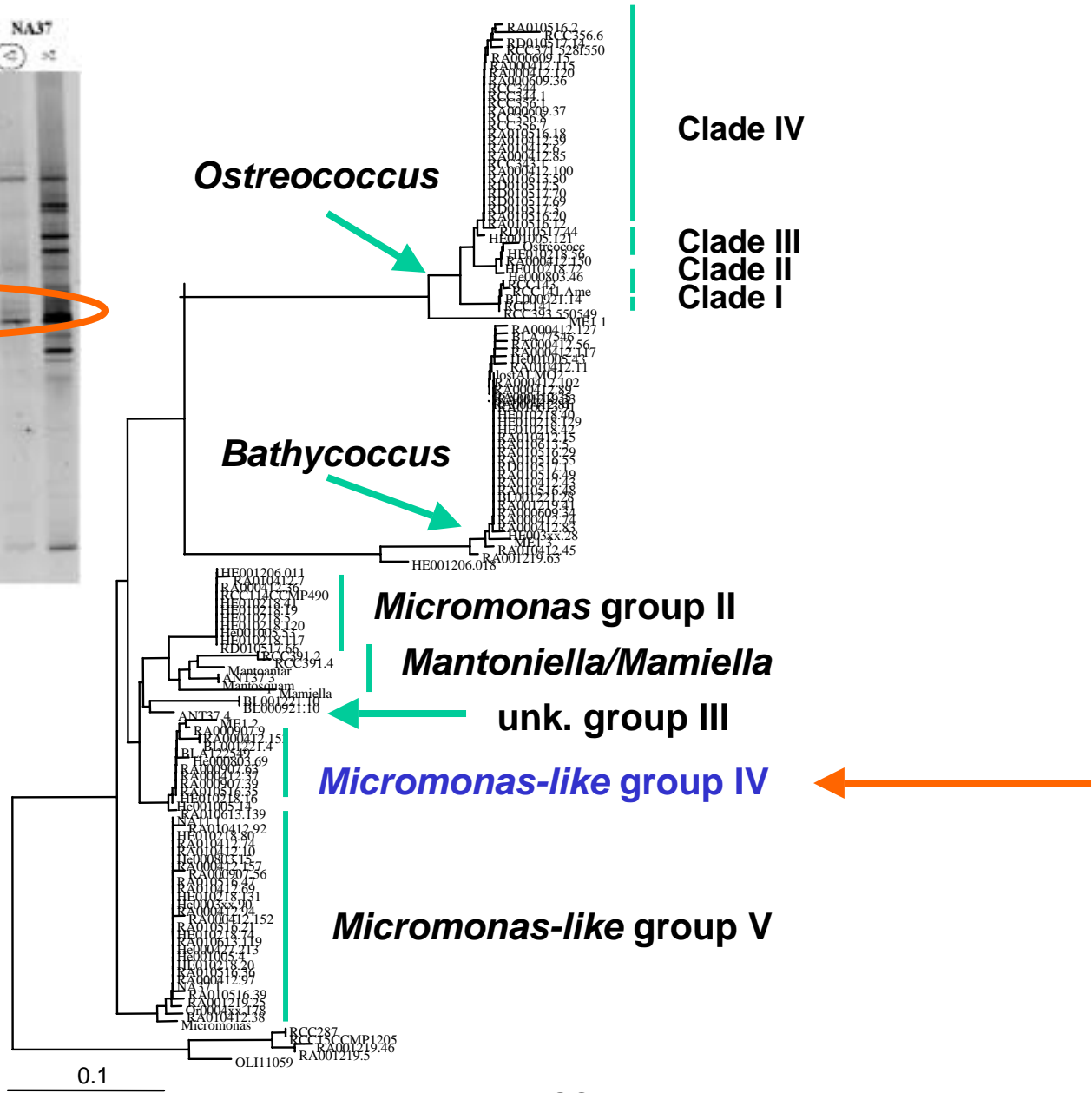
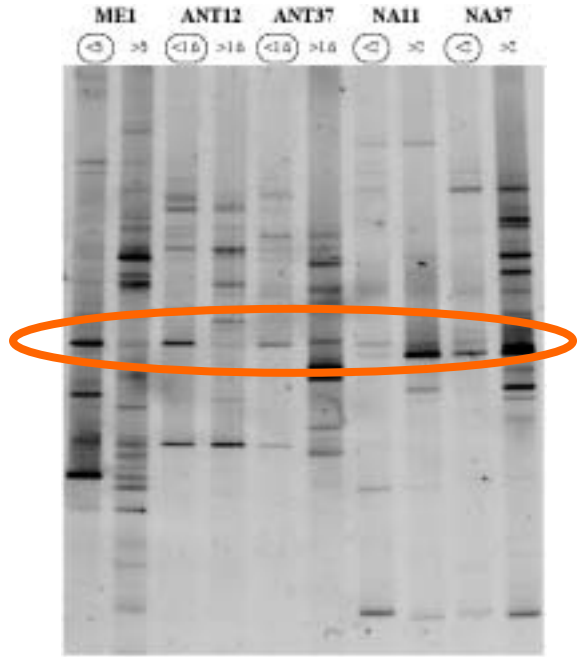
## Genetic diversity of Prasinophytes

		Reference in clone libraries	Reference in culture
	<b>Mamiellales</b>		
1	<i>Bathycoccus prasinus</i>	BL010320.30	BLA77, 118, 76
2	<i>Ostreococcus tauri</i>	RA000412.150	RCC116
3	<i>Ostreococcus</i> sp. clade II	BL000921.14	RCC141, 143, 393
4	<i>Ostreococcus</i> sp. clade IV	RA010412.39	RCC356, 371, 344, 343
5	<i>Mamiella</i> sp.	Not detected	RCC391
6	<i>Micromonas pusilla</i>	RA000412.36	RCC373, 114, BLA74/8, 105/7
7	Unknown genus (group III)	BL000921.10	Not obtained
8	Unknown genus (group IV)	RA000412.37	RCC434
9	Unknown genus (group V)	RA000412.97	RCC372
10	Unknown genus (group VI)	Not detected	BLA82/7, 70/7
	<b>Chlorodendrales</b>		
11	<i>Scherffelia</i> sp.	BL010625.2	Not obtained
12	Unknown genus	BL010625.1	BLA 148/9
	<b>Pyramimonadales</b>		
13	<i>Pyramimonas</i> sp.	BL010625.18	Not obtained
	<b>Pseudoscourfieldiales</b>		
14	<i>Pseudoscourfieldia/Pycnococcus</i>	Not detected	RCC253, 261, 244
15	Uncharacterized	Not detected	BLA78/7
16	New order	RA001219.46	RCC287, 15

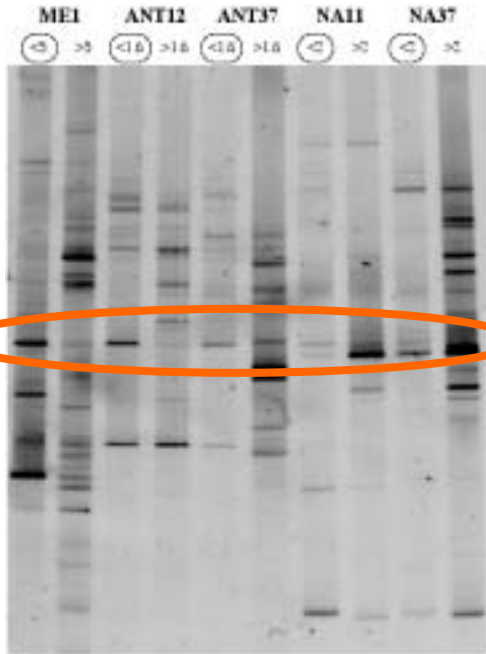


# Genetic diversity of the Mamiellales



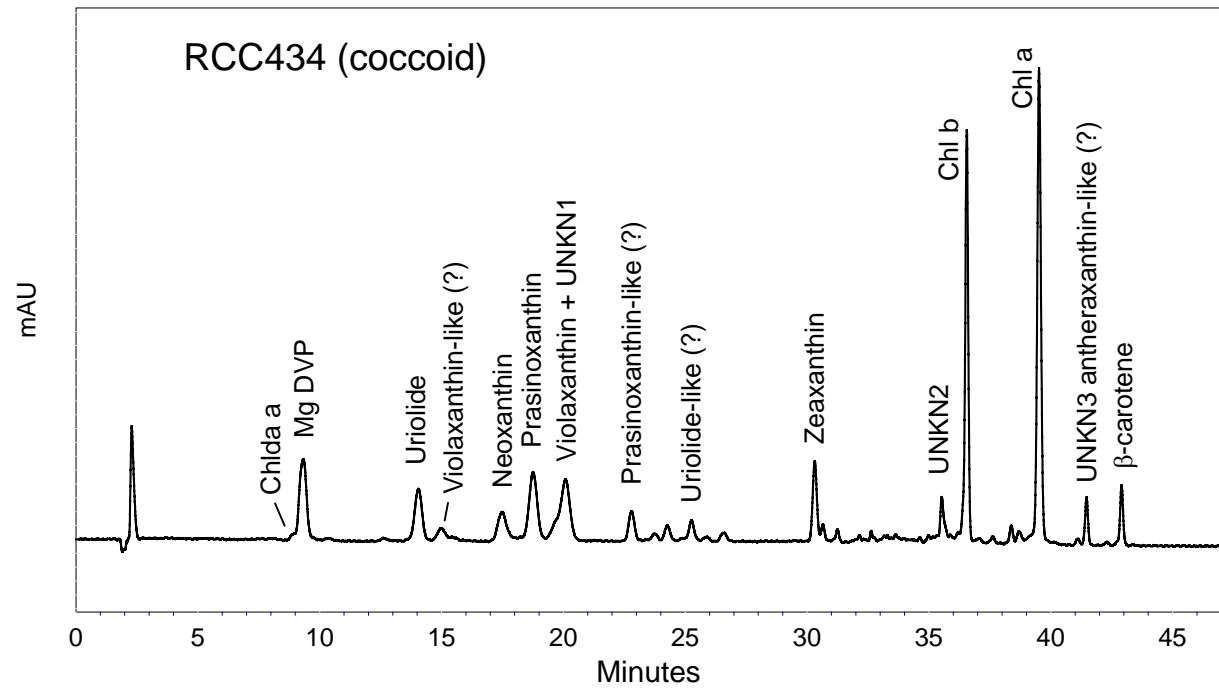


SSU rDNA, NJ, Partial sequences



**RCC434 = a very ubiquiste Prasinophytes**

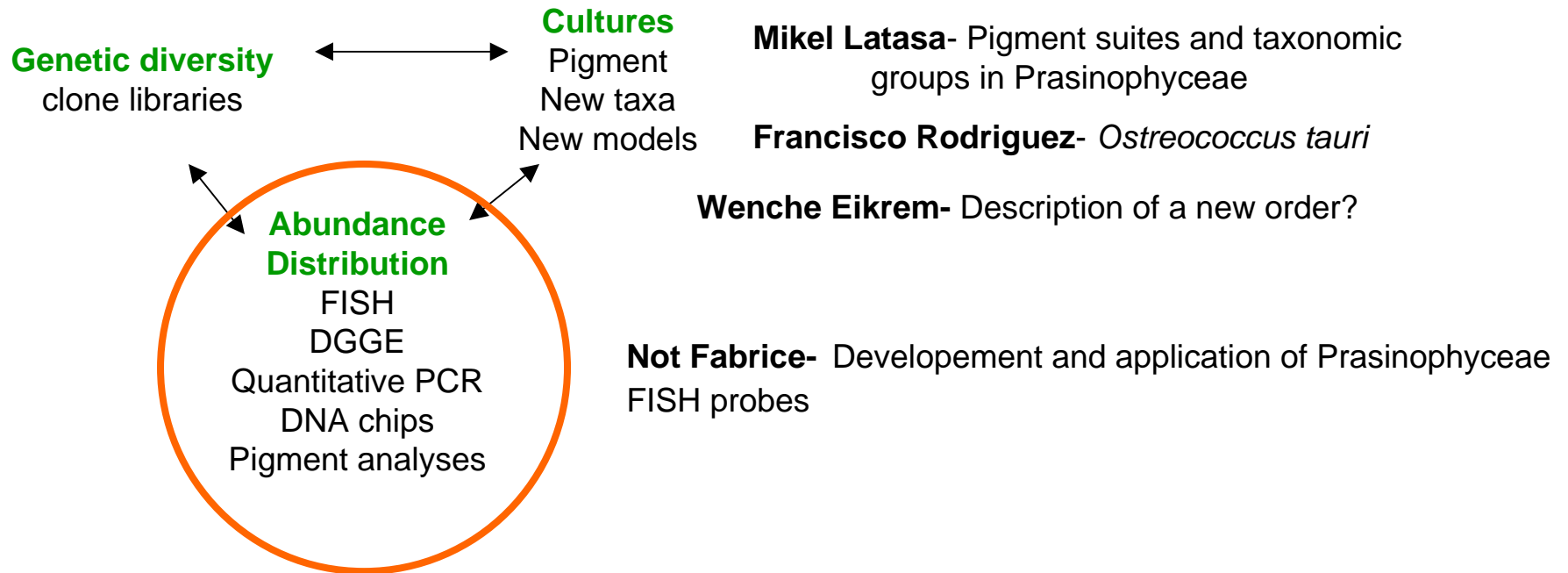
→ **Micromonas-like species,  
 Non scaly organism  
 Alternance of coccoid-flagellates stages ?**



# PICODIV

European Project EVK3-CT-1999-00021

## Monitoring the diversity of photosynthetic picoplankton in marine waters



## Microscopie électronique



**Wenche Eikrem**  
Université d'Oslo

## Analyse pigmentaire



**Mikel Latasa**  
ICM, Barcelone

## Librairies de clones



**Ramon Massana**  
ICM, Barcelone



**Khadidja Romari**  
SBR, Roscoff