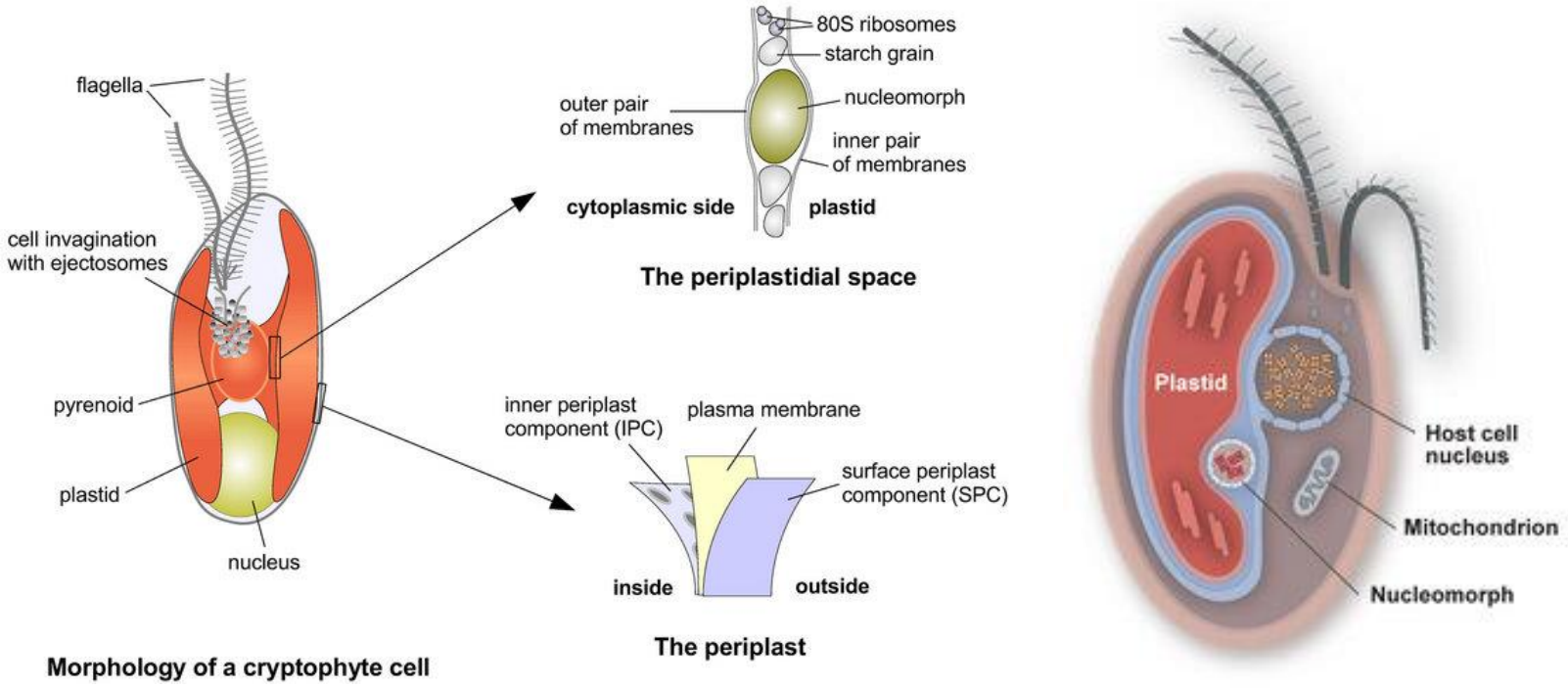
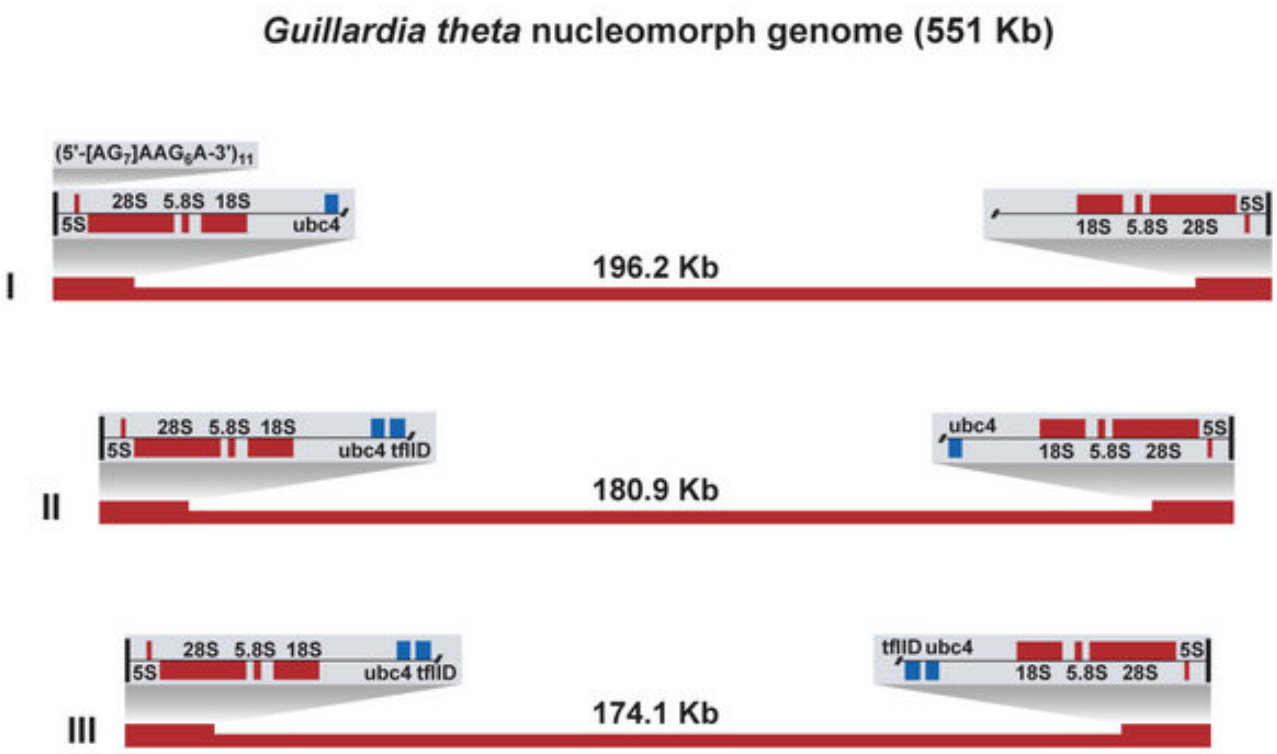
# Lineage *Cryptophyta*




http://tolweb.org/Cryptomonads/2396

# Nucleomorph Genome




http://tolweb.org/Cryptomonads/2396

# Crypt of the cryptophytes

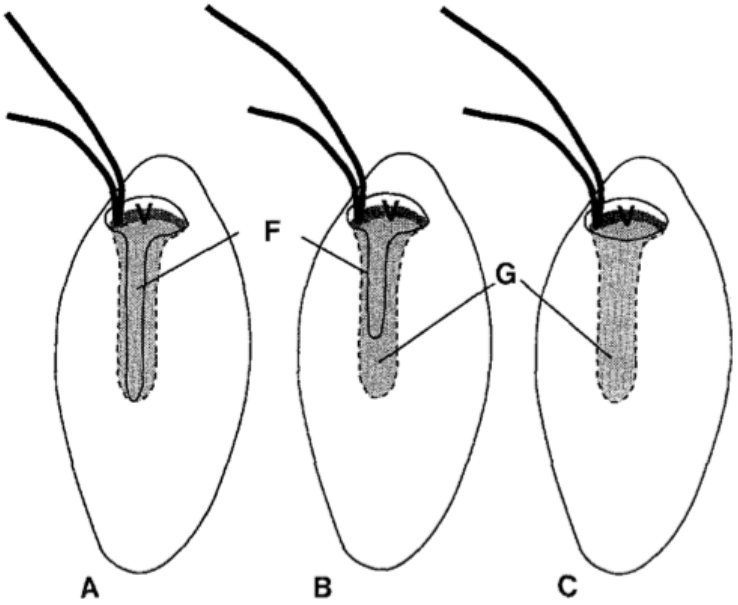
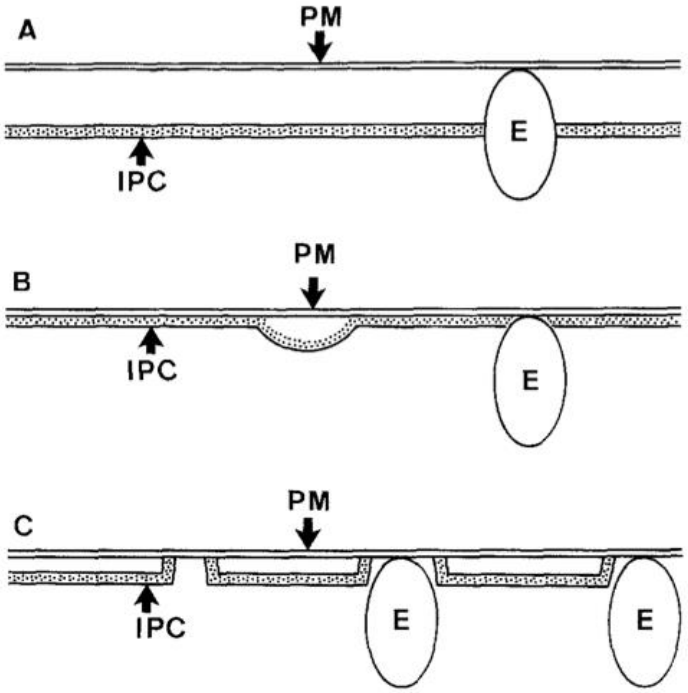



**Fig. 1 A–C.** Organization of the vestibulum (*V*), furrow (*F*), and gullet (*G*) in the Cryptophyceae. **A** In *Proteomonas, Falcomonas, Plagioselmis*, and *Teleaulax* a furrow progresses along the ventral surface from the vestibulum. **B** *Rhodomonas, Cryptomonas, Capylomonas,* and *Geminigera* possess both furrow and gullet. **C** The vestibulum extends internally to form a gullet in *Komma, Chroomonas, Rhinomonas, Hemiselmis, Guillardia*, and *Storeatula*

V – Vestibulum (vestíbulo)
F – Furrow (sulco)
G – Gullet (garganta)

Brett et al. (1994)
*Protoplasma* **181**, 106.

# Types of periplasts



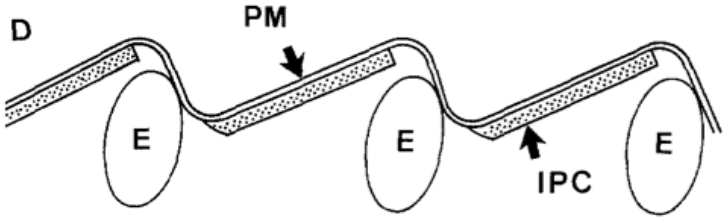



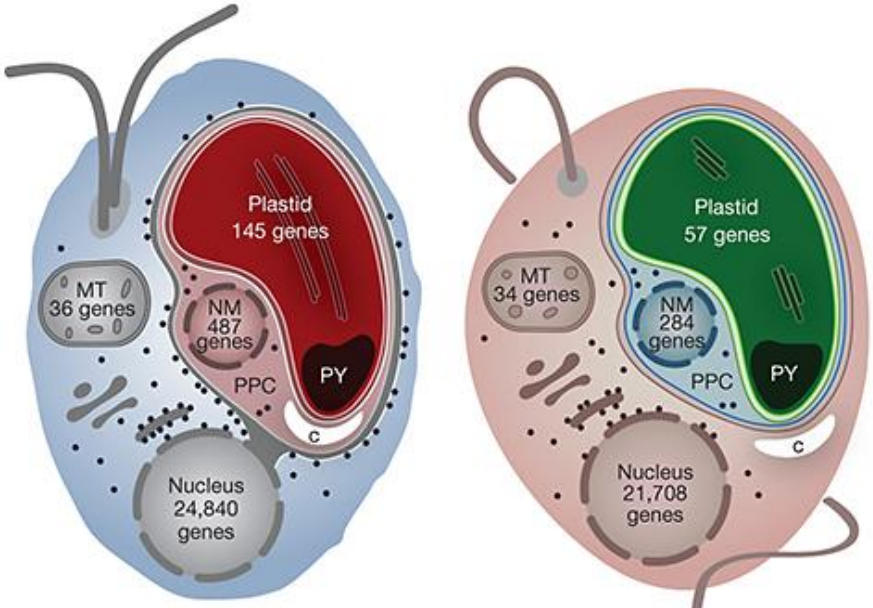

**Fig. 2 A–D.** Variations in inner periplast component (ICP) morphology throughout the Cryptophyceae. **A** ICP comprising a continuous sheet of material which is never closely associated with the PM. Ejectisomes (*E*) pass through pores in this sheet to contact the PM. **B** IPC comprising continuous sheet of material, closely appressed to the PM. This sheet may occasionally appear separated from the PM. **C** IPC consisting of discrete plates which are strongly attached to the PM at their edges. **D** IPC of discrete anteriorly stepped plates closely appressed to the PM. Ejectisome vesicles associate with PM adjacent to the anterior corners of plates

Brett et al. (1994)
*Protoplasma* **181**, 106.

# Features of the cryptophytes

- Biflagellated cells
- Live in marine and freshwater habitats
- Survive at low light levels
- They have phycobiliproteins
- Great importance in the food chain
- They have chloroplasts with 4 membranes
- They have a crypt that is structurally supported by a periplast
- They have chlorophyll $c_2$ instead of chlorophyll *b*
- They do not have allophycocyanin
- Periplastidial starch
- Thylakoids grouped in pairs

# Cryptophytes vs. Chloraracniophytes

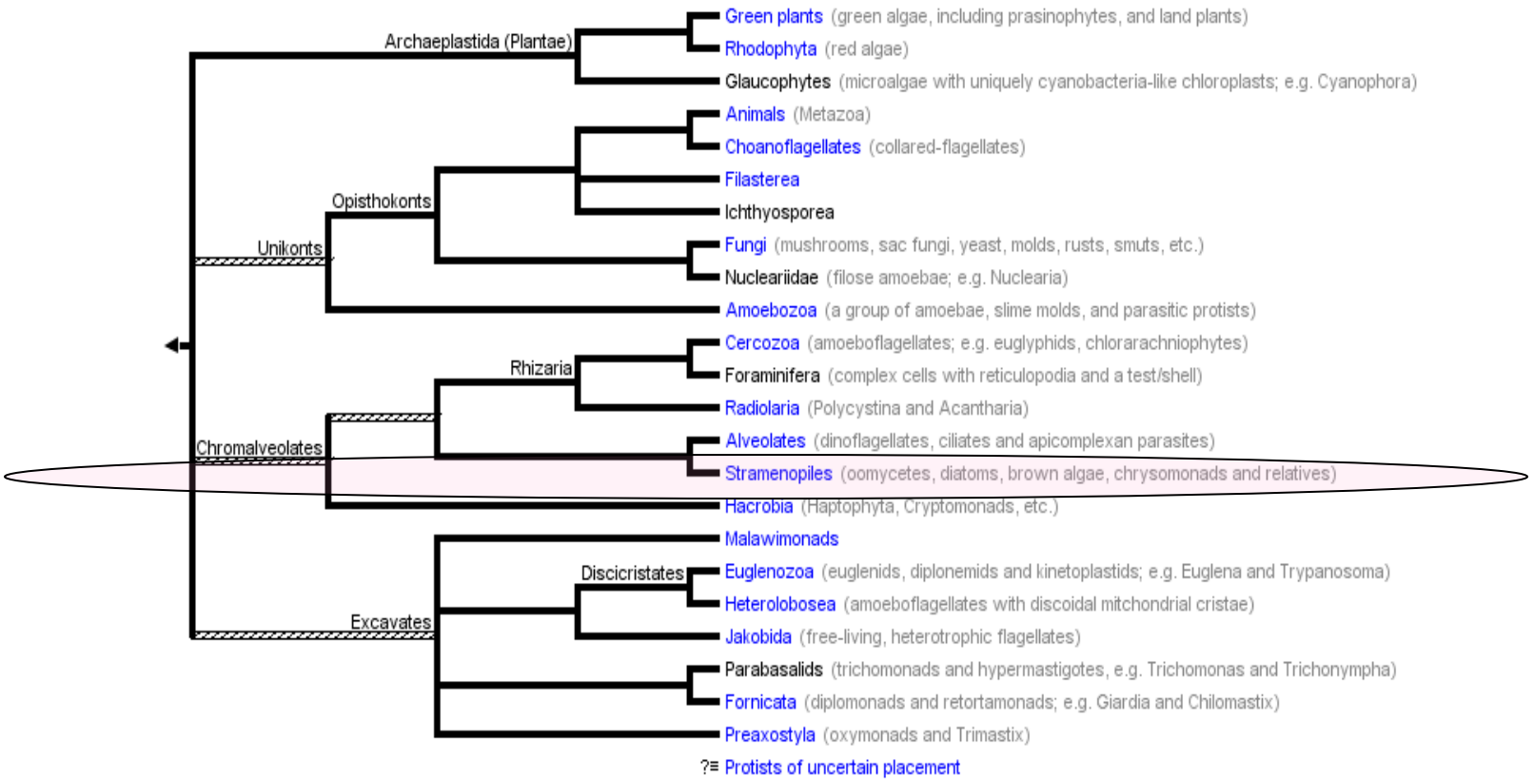



*Guillardia theta* *Bigelowiella natans*

| Chlorarachniophyta | Cryptophyta |
|---|---|
| Photosynthetic pigments: chlorophyll *a* and chlorophyll *b* | Photosynthetic pigments: chlorophyll *a* and *c2* as well as other pigments evolutionarily related to phycoerythrins |
| Do not have phycobilissomes or biliproteins | Biliproteins within the thylakoid lumen; thylakoids grouped in pairs |
| Uniflagellar ameboid cells with filamentous pseudopodia | 2 flagella inserted near a crypt and asymmetric ellipsoidal cells |
| Starch in cytoplasmic vesicles | Periplastic starch (between the plastid envelope and the two outer membranes) |
| Chloroplast surrounded by 4 membranes | Chloroplast surrounded by 4 membranes |
| ER not associated with the chloroplast | ER associated with the chloroplast |

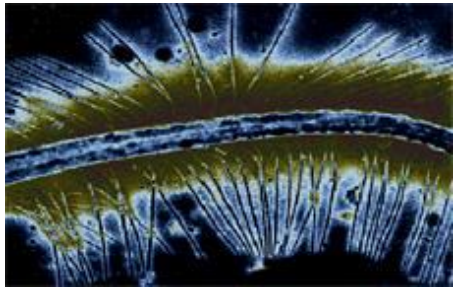
*http://www.laborjournal.de/blog/?p=5529*

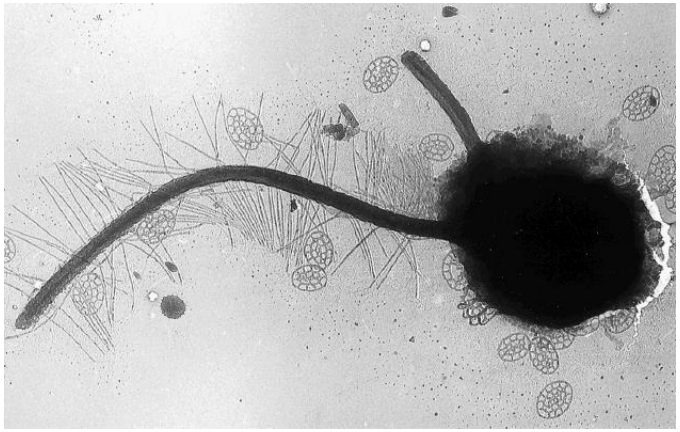
# Lineage *Stramenopiles*




http://tolweb.org/Eukaryotes/3

# Lineage *Heterokonts*





# Lineage *Heterokonts*

- *Heterokonts* ≈ *Stramenopiles*
- Biflagellated eukaryotic cells
- Anterior flagellum with mastigonemes (tripartite tubular hairs)
- Hairless posterior flagellum
- Chloroplasts surrounded by 4 membranes (photoautotrophic sub-lineage: *Ochrophyta* ≈ *Heterokontophyta*)
- However, there are cells that have lost one or more flagella

# Lineage *Heterokonts*

- Diatoms (> 100,000 species)
- Brown seaweeds (*Phaeophyceae*)
- Eustigmatophytes (e.g., *Nannochloropsis*)
- Chrysophytes (golden algae)
- Pseudofungi: Oomycetes (heterotrophic sub-lineage)
- Bigyra: Includes the thraustochytrids (heterotrophic sub-lineage)

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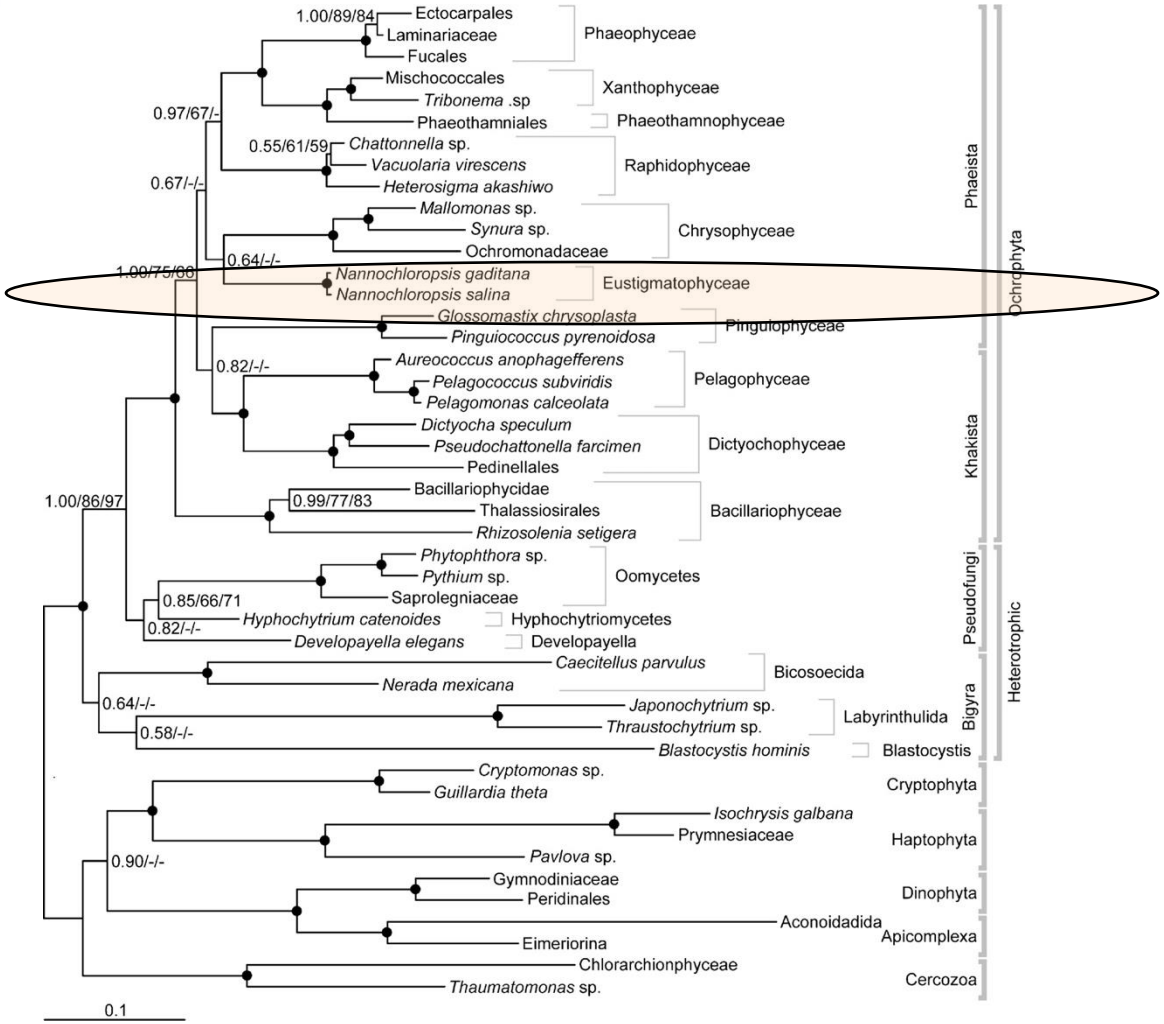
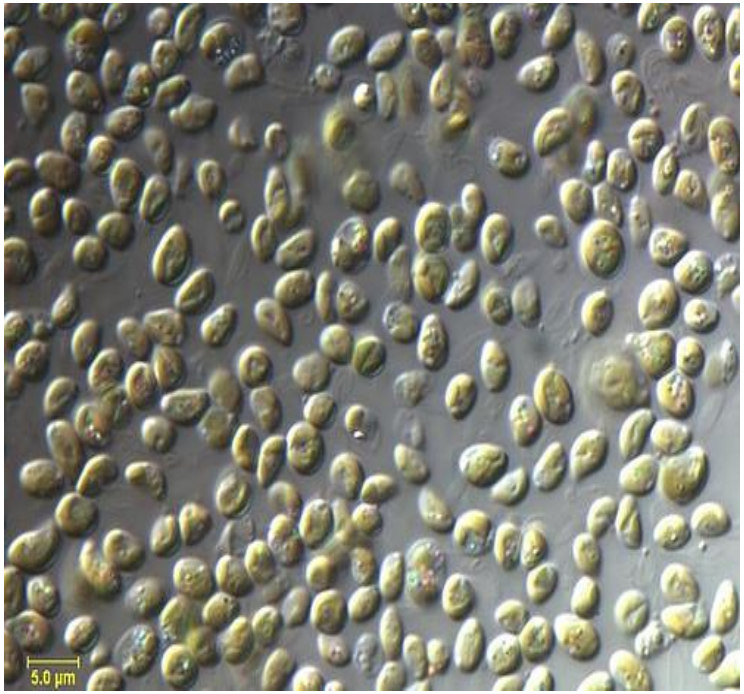



Riisberg et al. (2009)

# *Nannochloropsis*




- eustigmatophyte (not a green alga)
- small size
- spherical morphology
- do not have chlorophyll *b* or *c*
- rich in EPA
- oleaginous species