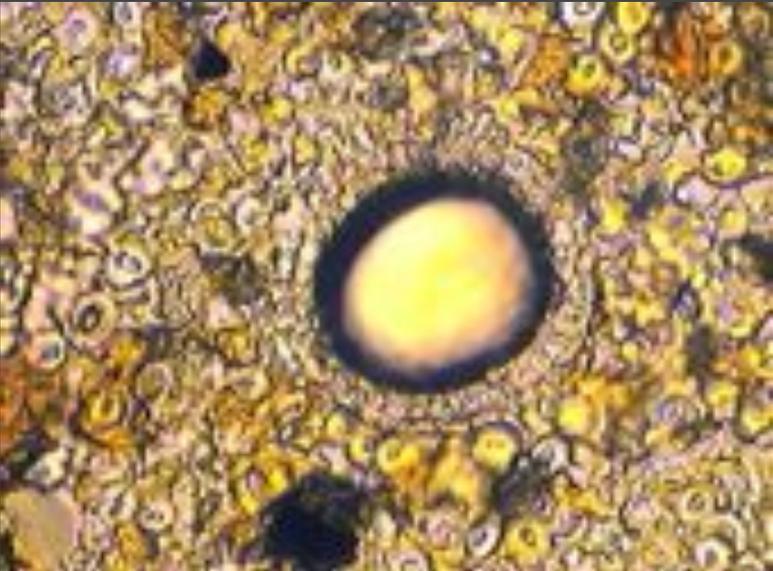
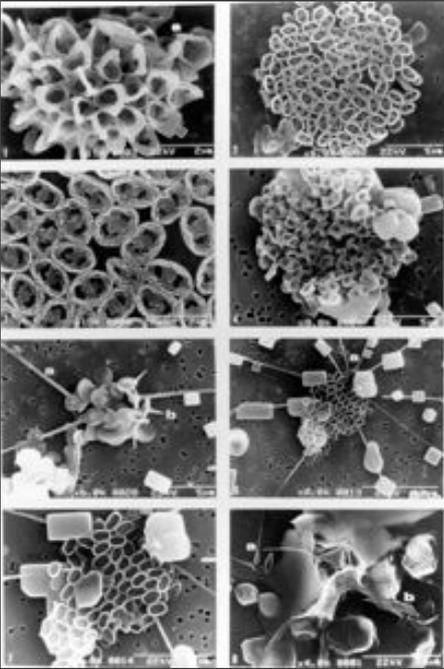


Oil Exploration at Sea

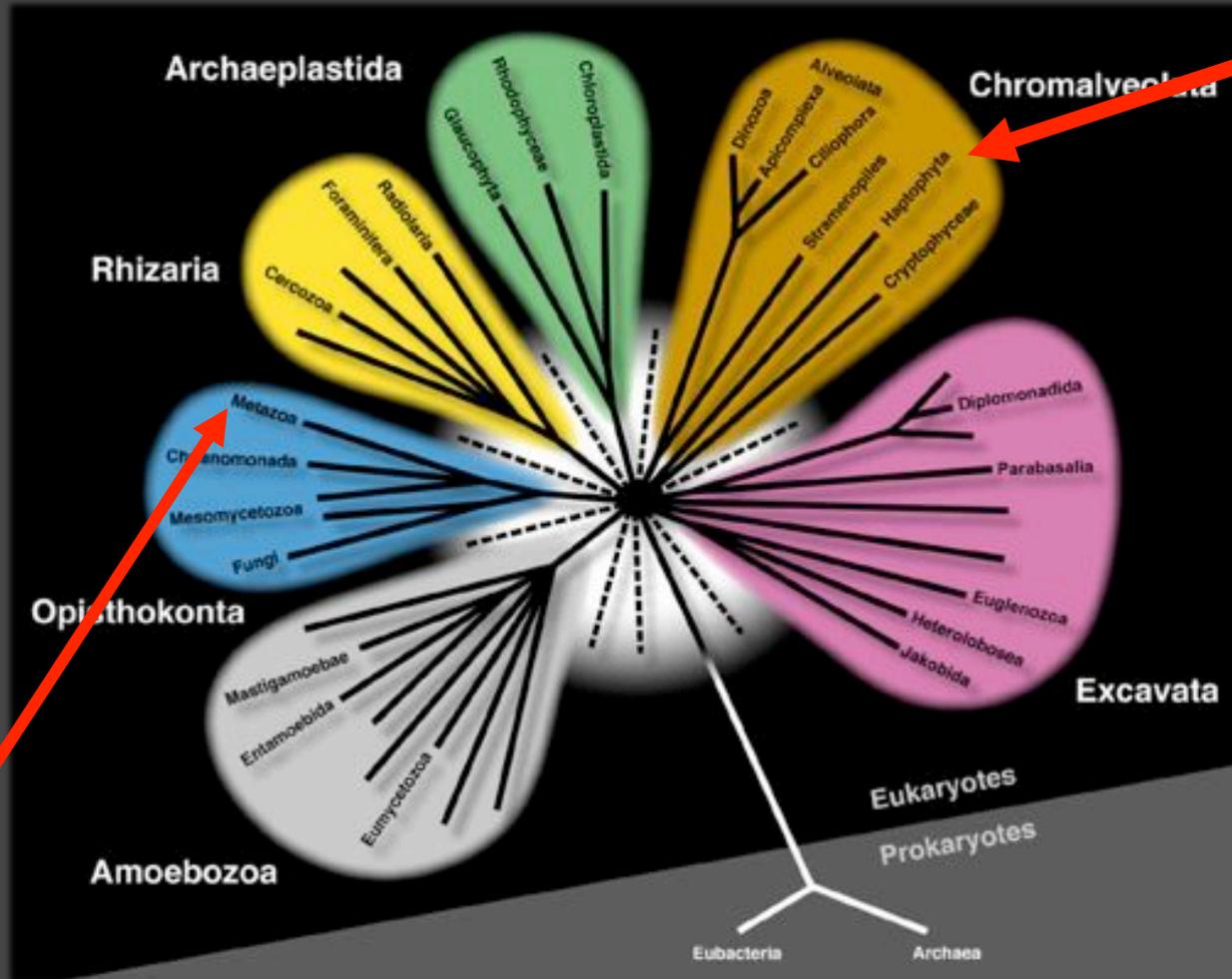


HAPTOPHYTA

The Coccolithophorids



Haptophytes are here



You are here!

CHROMALVEOLATES

CHROMISTA

ALVEOLATES

Stramenopiles:
Diatoms, Browns,
Chrysophytes, etc.
& Oomycetes

Haptophytes

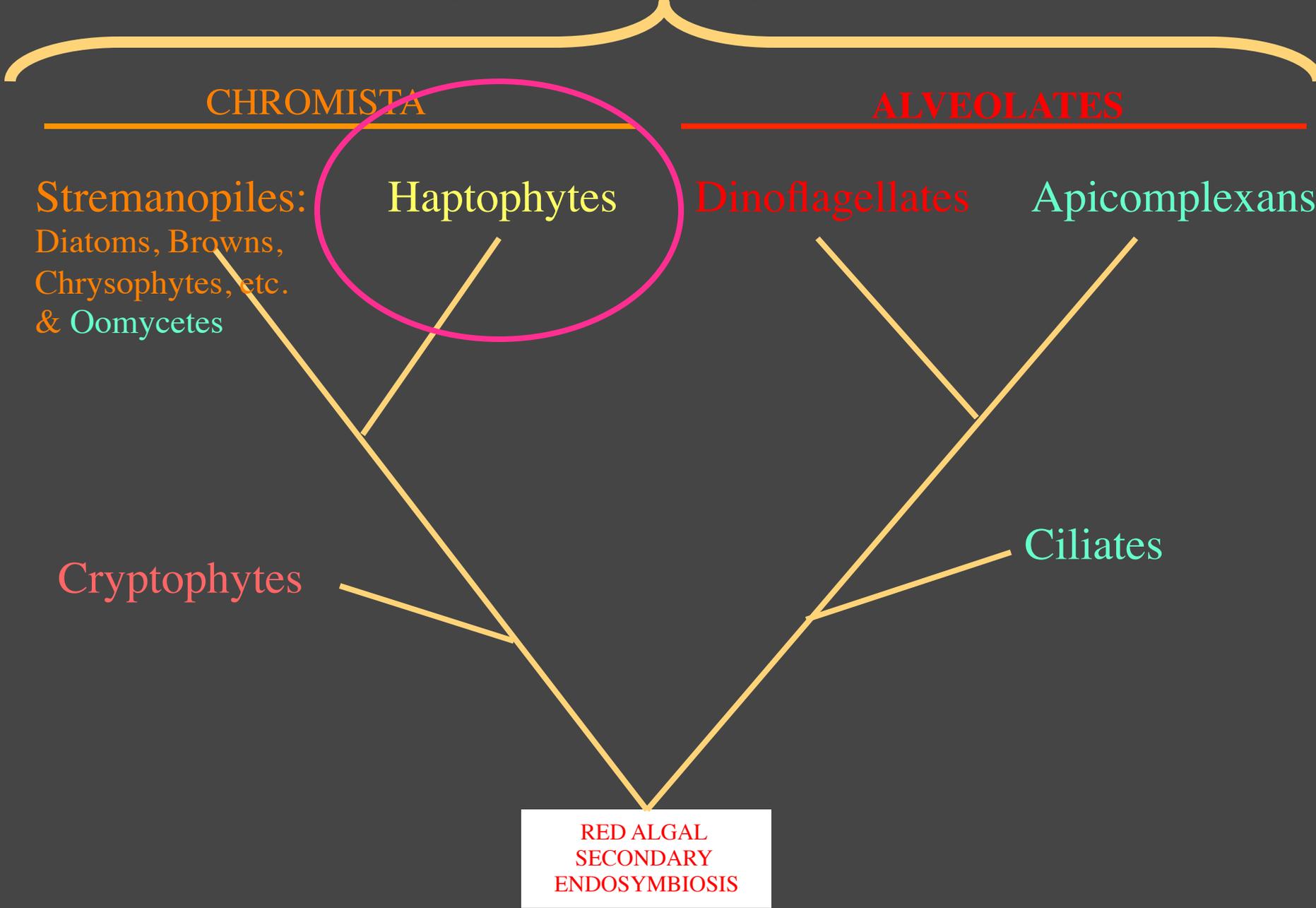
Dinoflagellates

Apicomplexans

Cryptophytes

Ciliates

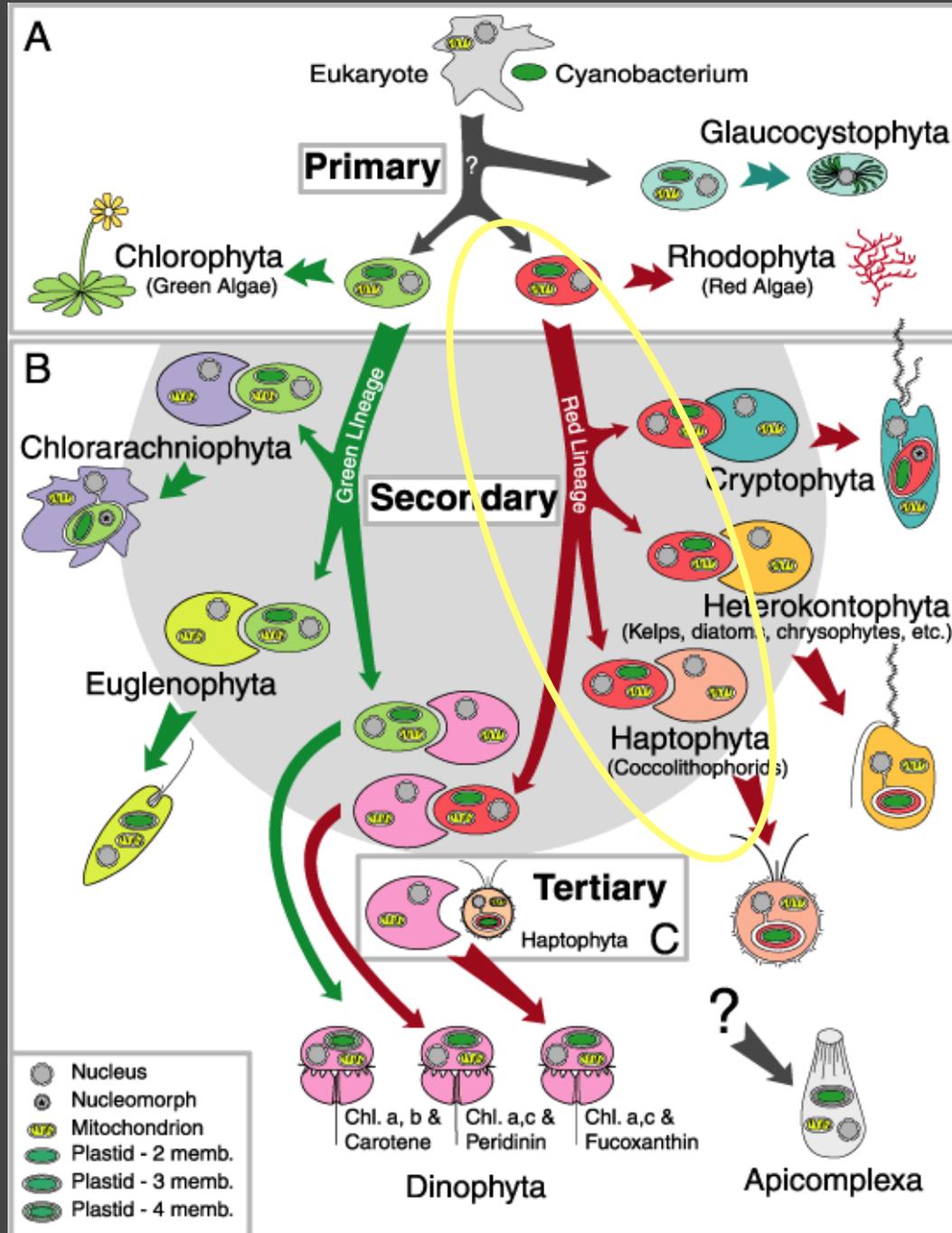
RED ALGAL
SECONDARY
ENDOSYMBIOSIS



Haptophytes or coccolithophorids are the product of another secondary endosymbiosis in the Red Lineage

Their plastids represent an ancestral eukaryotic red alga

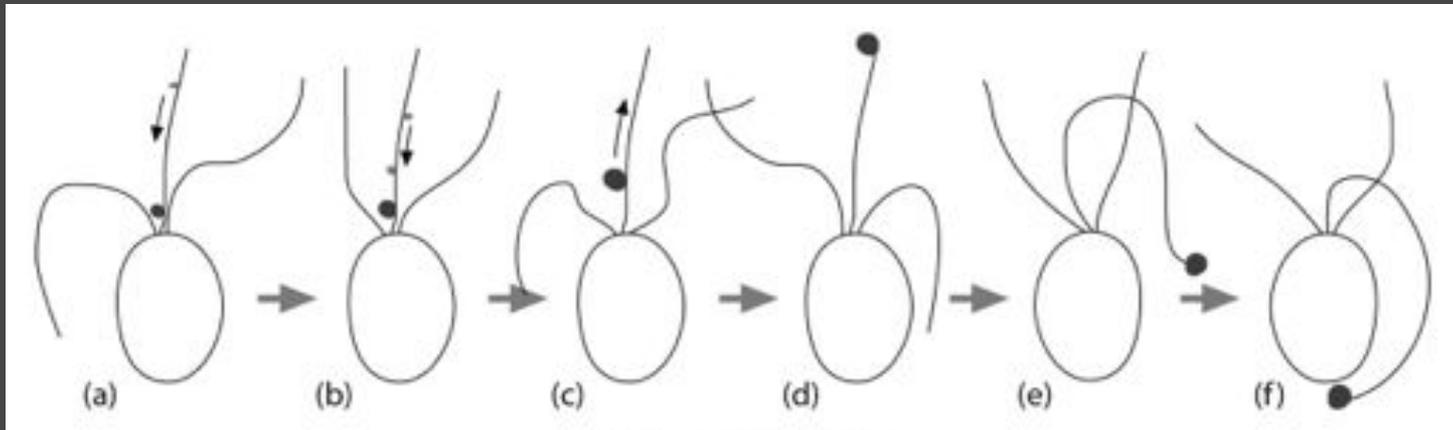
Haptophytes is a monophyletic independent lineage related to the Cryptomonads



Modified from Delwiche, C.F. 1999. Tracing the thread of plastid diversity through the tapestry of life. Am. Nat. 154:5164-5177.

The Haptophytes (=Prymnesiophyta)

1. Abundant in marine waters
2. Flagellated unicells
3. Small **nannoplankton**
4. Flagella 2 smooth (9+2) and a **Haptonema** with 3–7 microtubules! With a sticky tip to catch food or for attachment!!!
Probably evolved by duplication and modification of a flagellar root

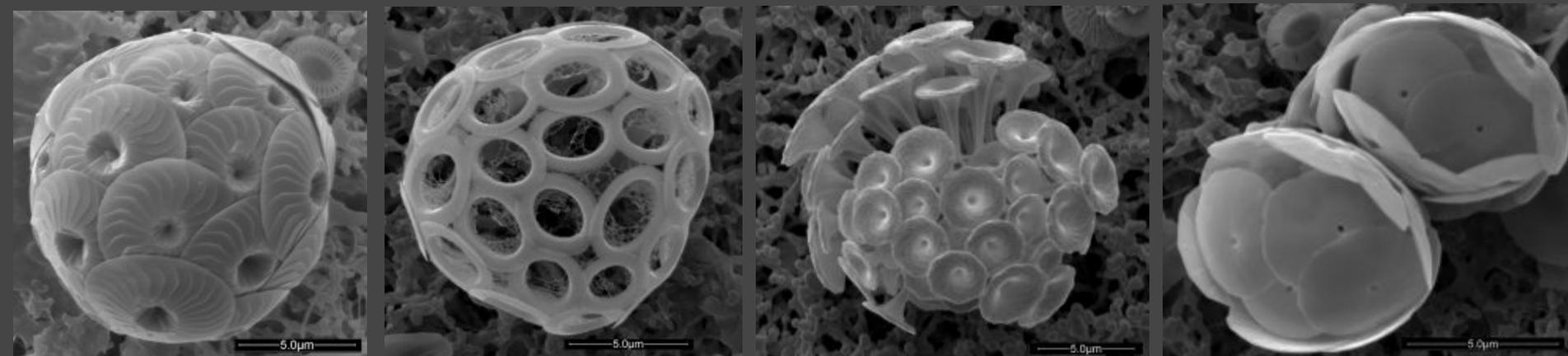
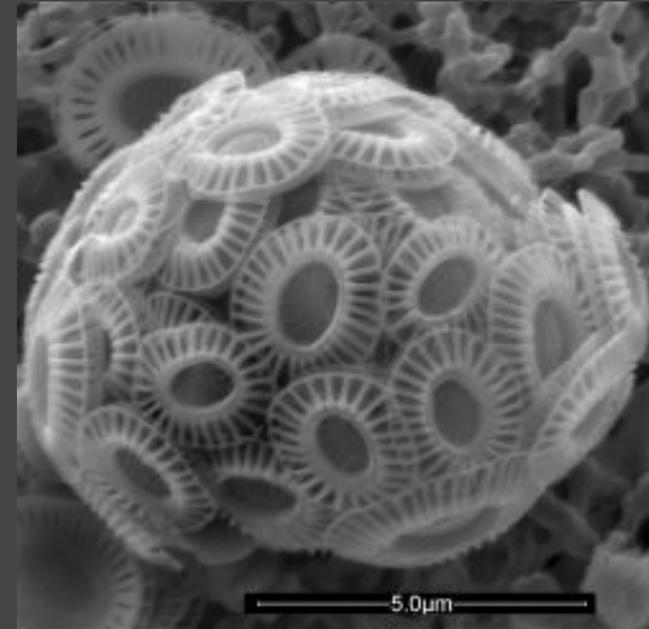


5. Chlorophylls *a* & *c*, fucoxanthin, diadinoxanthine & β -carotene
6. One or two chloroplasts with thylakoids stack in groups of 3's
7. PER present
8. Reserve: **Chrysolaminarin**
9. Mitochondria with **tubular cristae**
10. Cell naked or with organic scales or calcified scales

Coccoliths: a mineralized scale

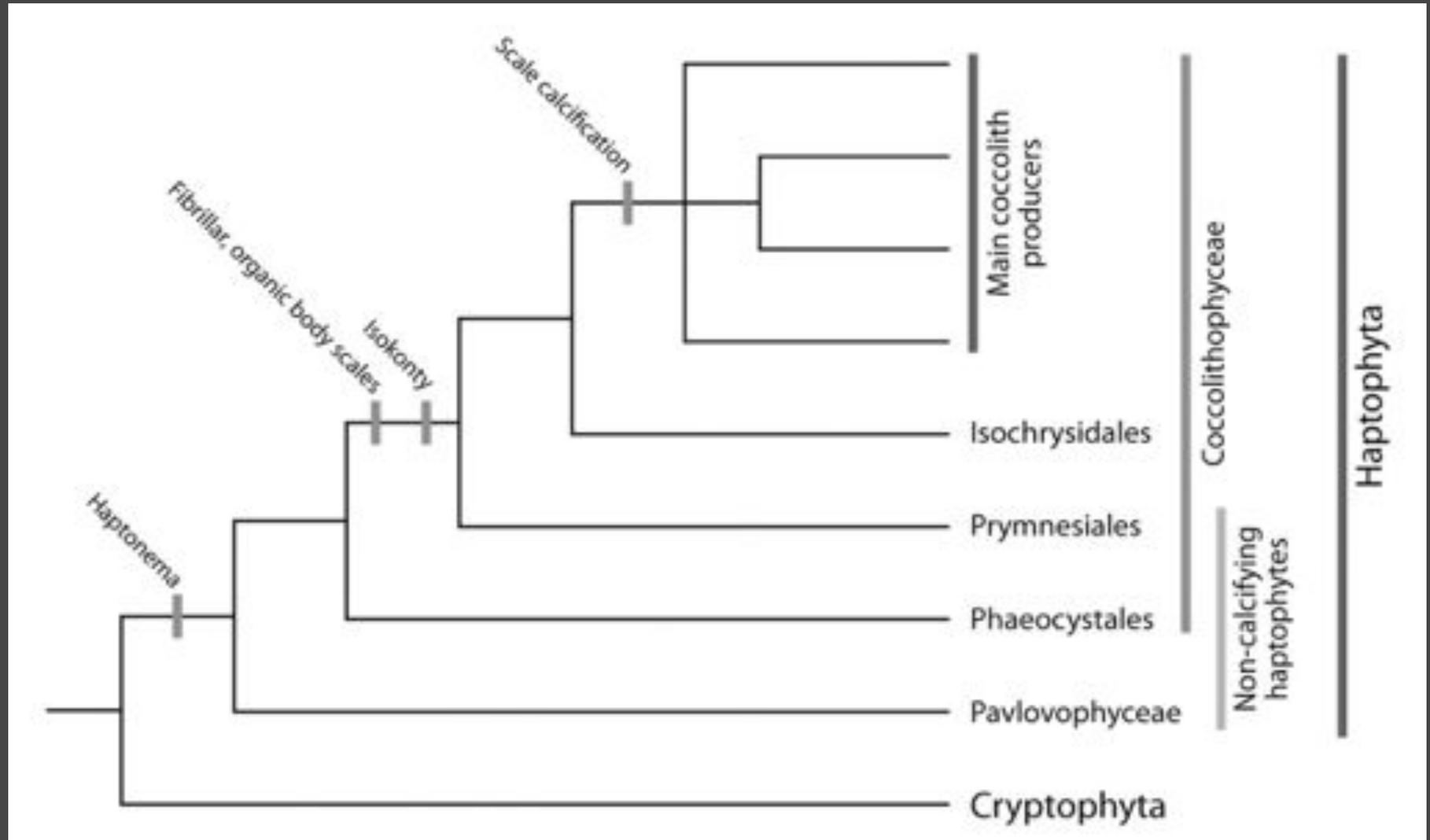
Coccosphere: a surface covered by coccoliths

Coccolithophorids: haptophytes enclosed by coccospheres



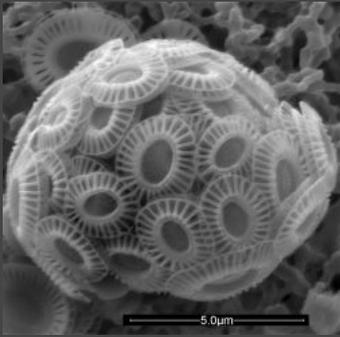
Haptophytes are the sister group to Cryptophyta

Two main groups in haptophytes are the **Pavlovophyceae** (unequal flagella) and the **Coccolithophyceae** (equal or no flagella)

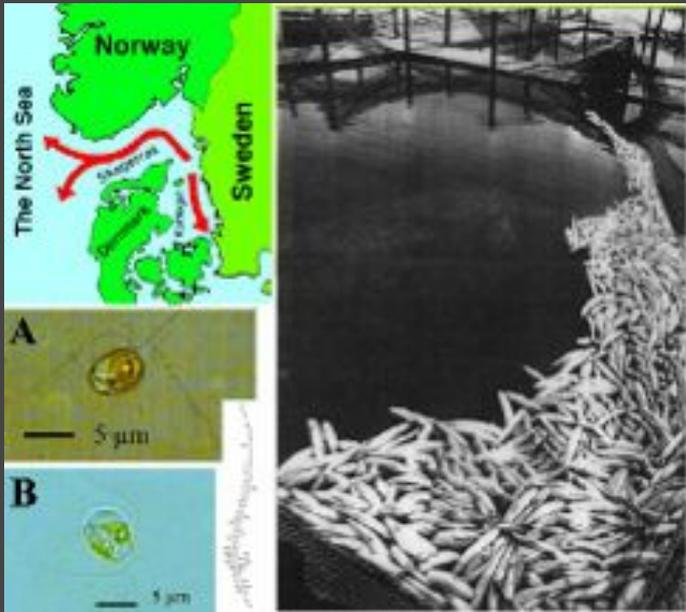


The coccolithophorids are known as the “pasturage of the seas,” i.e. *Emiliana*, an HAB species

When abundant, coccoliths shed into the water may cause a milky discoloration that satellites can detect!



- *Chrysochromulina* with organic scales damage fish gills causing fish mortality
- *Phaeocystis* common in polar waters, may discolor the water brown and cause foaming
- *Prymnesium* produces a toxin killing fish
- *Pavlova* & *Isochrysis* = food for oysters, fish and other seafood; the **omega-3 fatty acids** are obtained from algae

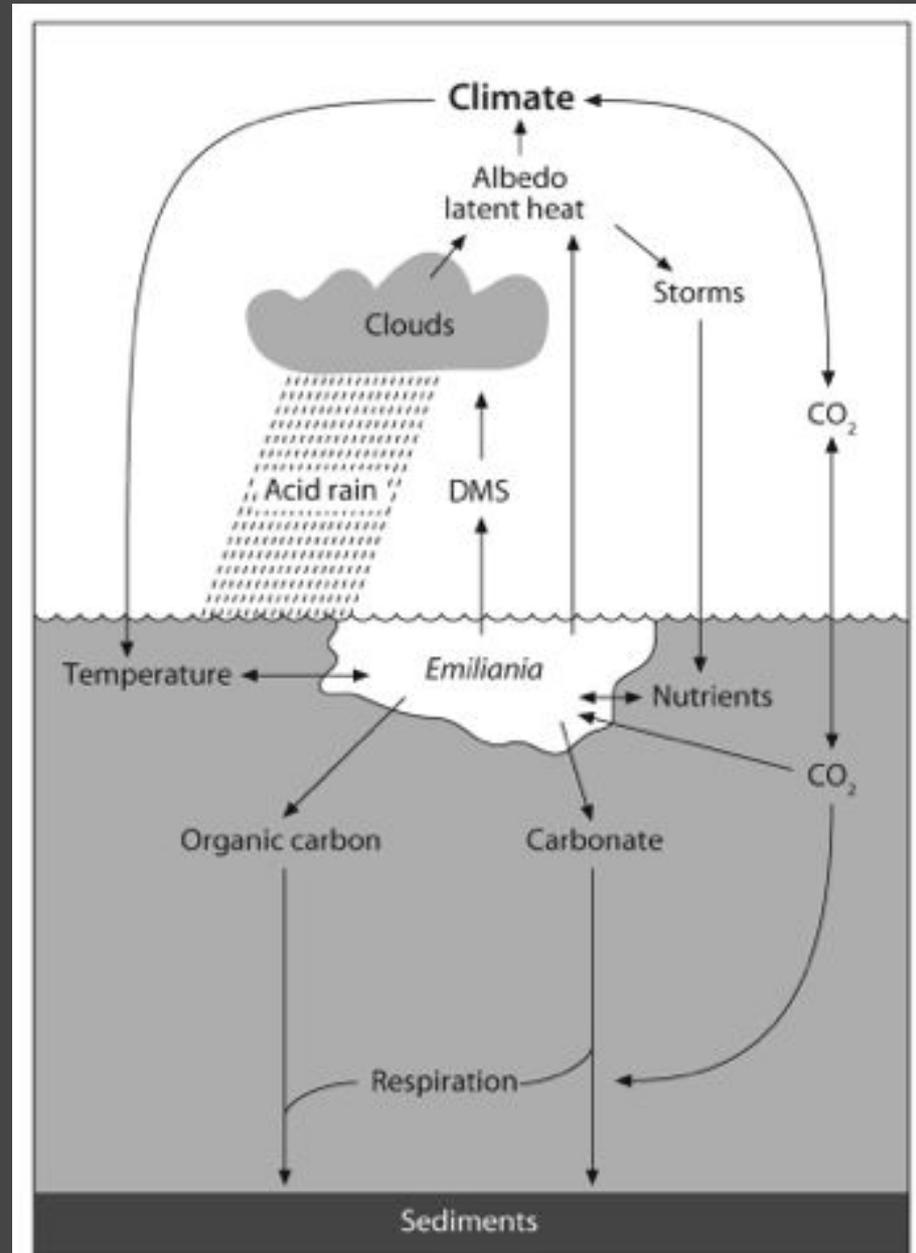


Fish mortality caused by the ichthyotoxic *Chrysochromulina polylepis* along the Swedish and Norwegian marine waters



Biogeochemical Impacts of Haptophytes

- **Coccolithophorids influence global carbon cycling**: coccoliths sequester atmospheric CO_2 for a long time
- Haptophytes are an important source of DMS (dimethyl sulfide), a volatile sulphur-containing molecule that increases **acid rain**
- Coccoliths increase **albedo** (reflectance of the earth's surface) and having a cooling influence on the climate
- Increase acidification of oceans, by rising atmospheric CO_2 , will affect the survival of coccolithophorids (decrease of the cooling effect = **global warming**)



Because of their calcified scales, coccolithophorids are well known as **fossils** for the paleontologists

Abundant in the Jurassic, fossil Coccoliths formed white carbonate deposits of chalk such as **White Cliffs of Dover**

