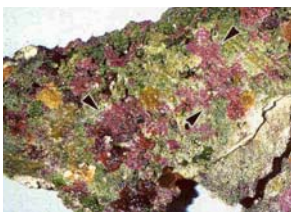
Division: Rhodophyta

>5000 species
98% marine

Division Rhodophyta……

-most speciose of the macroalgae

Location	S. Aust.	N. Atlantic	CA
Red	800 (70%)	589 (50%)	459 (69%)
Brown	231	324	137
Green	123	258	72
	1154	1171	668



Biogeography/distribution……..

- Found at all latitudes
- Shift in abundance from equator to poles
- Temperate / Tropical
  - highest # of spp (outnumber browns and greens)
- Polar
  - relatively few species – browns and greens dominate
  - lots of crustose coralline reds, to 200 m
- Size distribution
  - tropical = mostly small filamentous plants (except calcareous forms)
  - temperate = larger fleshy species

General Red Characteristics……

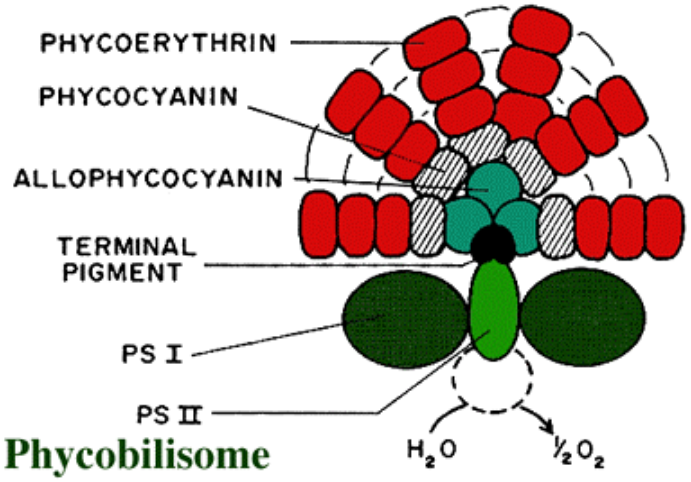
1) Pigments: chl a
   carotenoids: A-carotene, B-carotene
   Phycobilins: phycoerythrin, phycocyanin, allophycocyanin

2) Chloroplast structure:
   - envelope:
   - thylakoids:

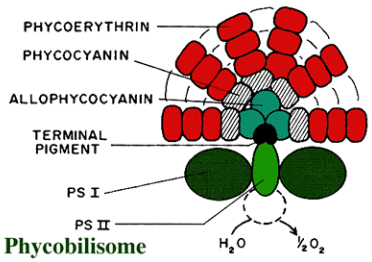
3) Storage product:

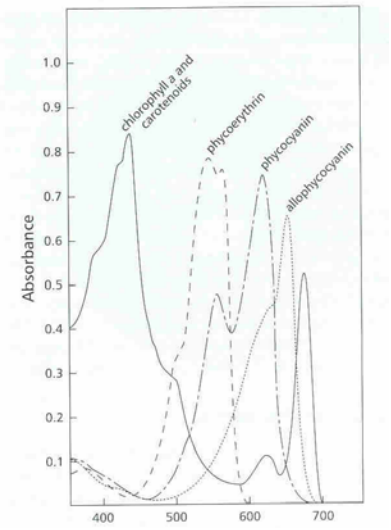
4) Flagella:

Phycobilisome = light antenna…….



Pigments…….





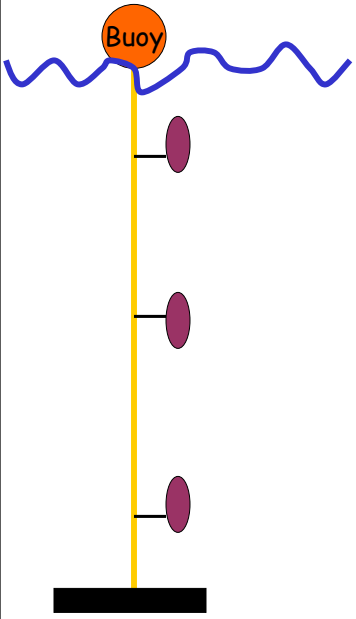
Pigments……

Reds adapt to changing light conditions by…

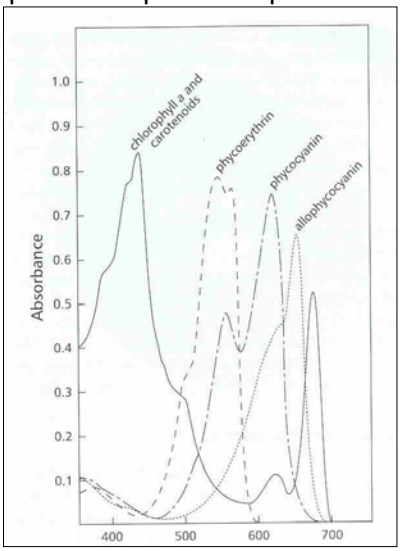
1. Changing the number/density of phycobilisomes
2. Changing the # of molecules of pigment in each antennae

…what is this called?

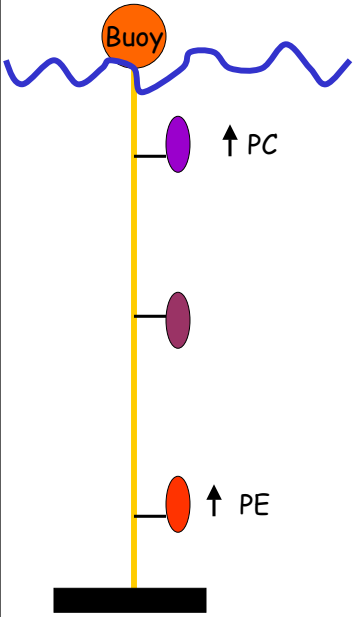
Pigments……

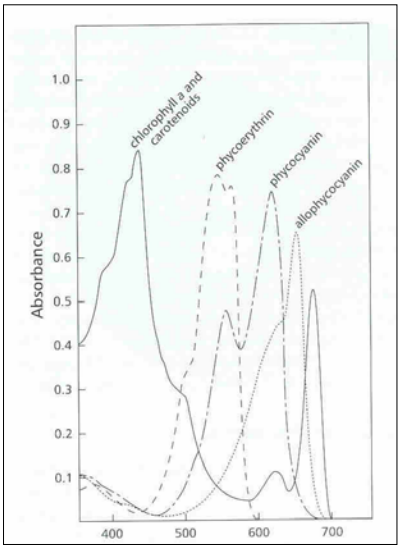


Experiment:
-same species of red algae
-place on rope at 3 depths



Pigments……





Cellular Structure……

Cell walls in red algae:

Principle wall component:
microfibrils (cellulose)

Mucopolysaccarides accociated with wall:
agar (agarose)
carageenan

("carageenan" after Irish county where *Chondrus crispus* is found)

Another weird red thing:

Closed mitosis, but NO centrioles ("nuclear associated organelles" – ring shaped)

Human Uses……

- Food
  - nori (porphyra)
  - 1949 life cycle completed – advanced cultivation techniques

- Phycocolliods = dervived from mucilagenous polysaccharides of cell walls
  - Thickeners
  - Stabilizers
  - Gels

- Two important phycocolliods:

  - Carageenan (toothpaste, cosmetics, chocolate milk, ice cream, dessert gels, pet foods)

  - Agar (food gel, pharmaceutical capsules, meedium for culturing microorganisms, gel electrophoresis)

Flagella……

- Spores – none

- Gametes –none

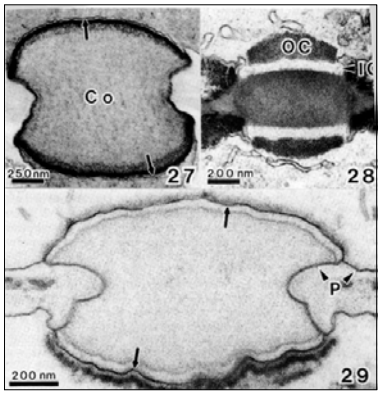
- "spermatia" = unflagellated male gamete; no free movement

- Passive dispersal by water

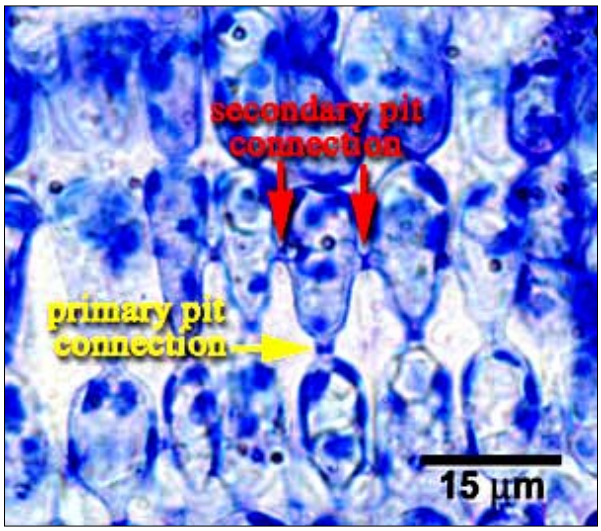
Pit plugs……

old name: "pit connections"

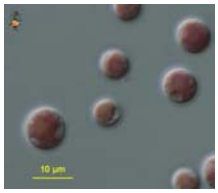
- Protinaceous plugs between cells
- Primary pit plugs → formed during cytokinesis between 2 daughter cells
- Secondary pit plugs → formed between non-related cells within and individual or between individuals (parasites)
- Not a real connection – unlike browns, not for transport
- function → structural support

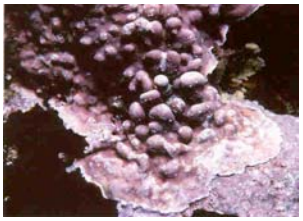


Pit plugs: primary vs. secondary…….



Morphology…….

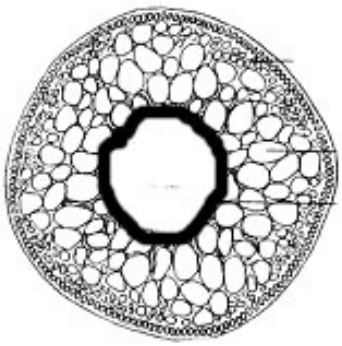


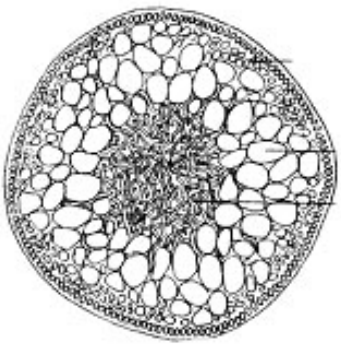


- some unicellular
- filamentous
- parenchymatous
- psuedoparenchymatous

Internal Morphology…….

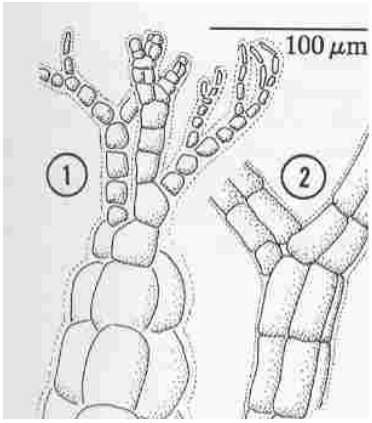
Uniaxial vs. Multiaxial

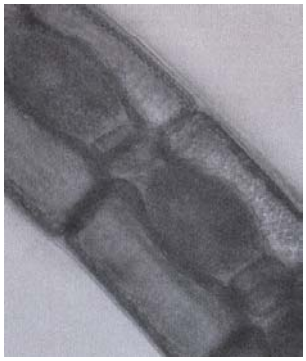




Morphology and growth……

Polysiphonous -
central filament surrounded by 4 or more pericentral cells

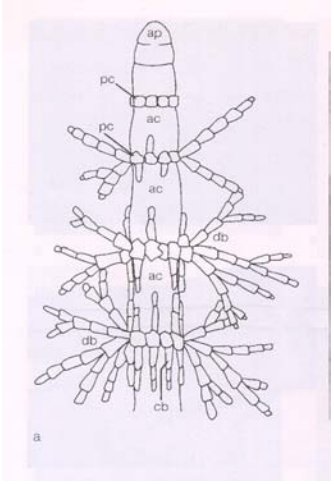


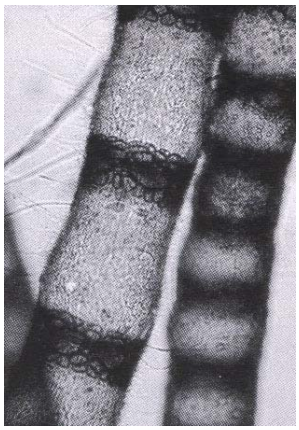


Polysiphonia spp

Morphology and growth……

Cortication – elaboration of polysiphonious condition where pericentral cells continue to proliferate

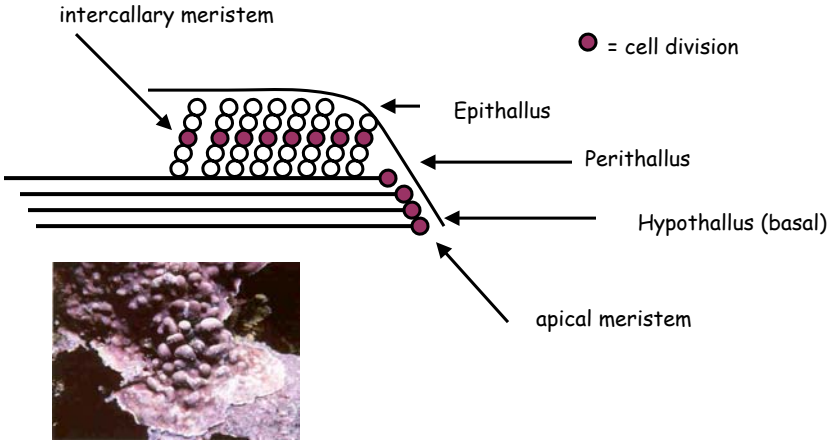




Partial Cortication

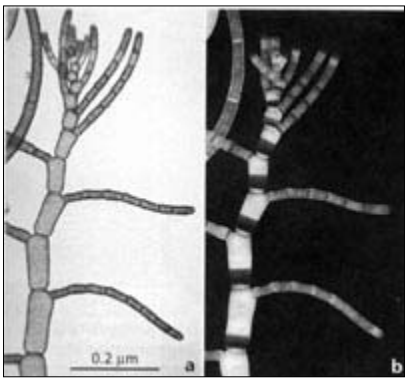
Morphology and growth……

Heterotrichous – filamentous growth in 2 directions, results in thallus composed of both prostrate + erect components

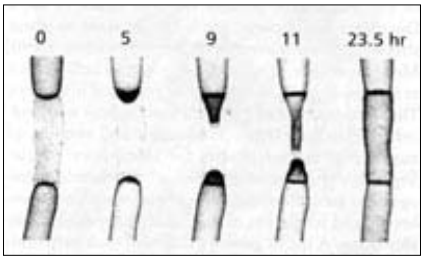


Growth……

Reds typically display growth through cell elongation…



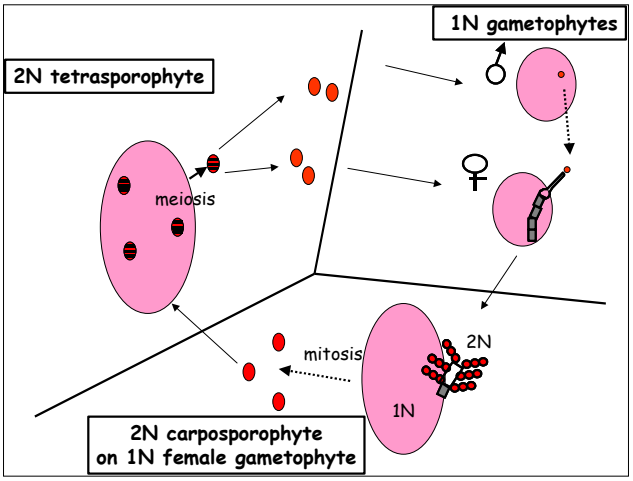
New growth = not florescent



Cell repair by cell fusion

Introduction to Triphasic Life History……

Three phases: Gametophyte, Tetrasporophyte, Carposporophyte



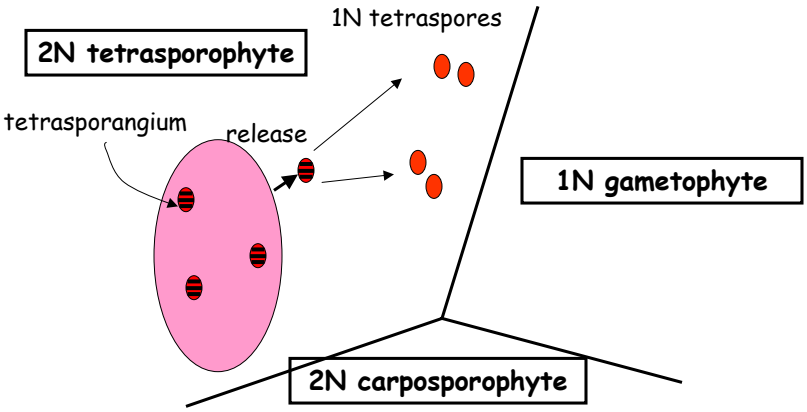
generalized version of triphasic life history

Some more new terms for red reproduction……

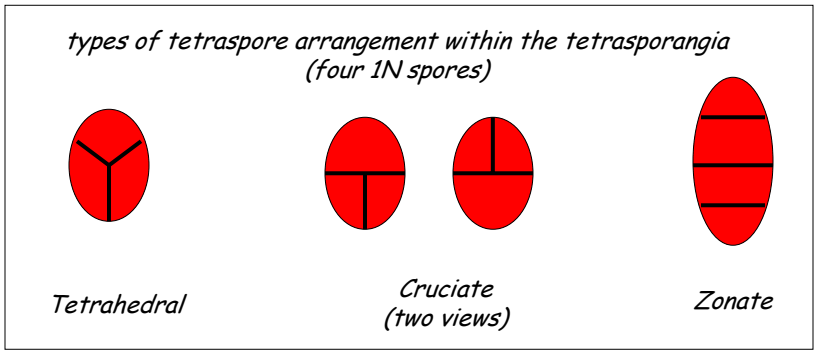
tetrasporophyte = 2N generation germinating from carposporophyte spores

tetrasporangium = 2N cell which undergoes meiosis to form 4 tetraspores

tetraspore = meiospore formed by meiosis from 2N tetrasporophyte cell



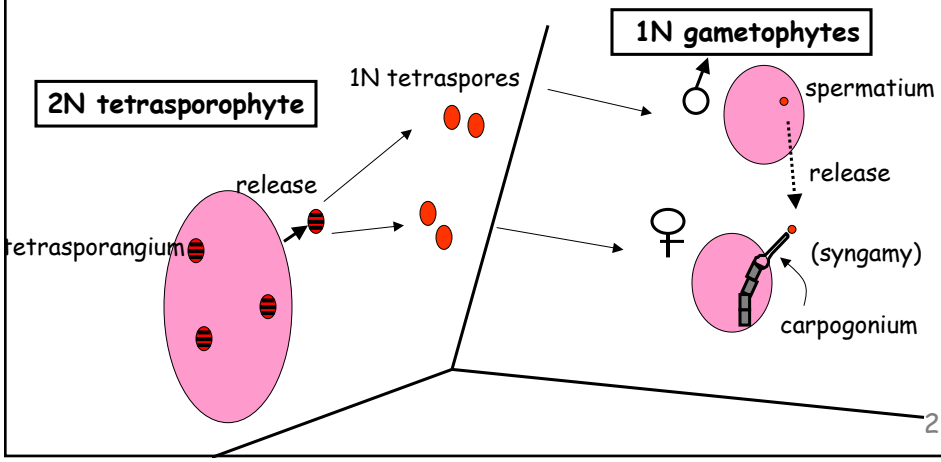
tetraspore = meiospore formed by meiosis from 2N tetrasporophyte cell



Some more new terms for red reproduction……

Spermatia = unflagellated male gametes

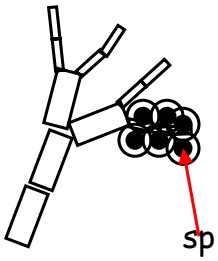
Carpogonium = female gamete; egg (used in place of oogonium in reds)



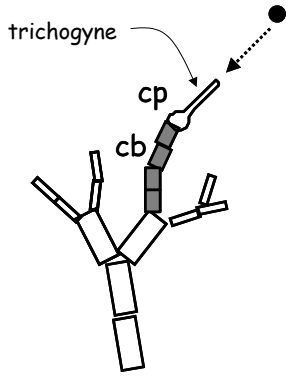
Some more new terms for red reproduction……

Trichogyne = extension of egg onto which spermatium attaches

Spermatangial / Carpogonial branch = filamentous branch on which the spermatia or carpogonium are formed

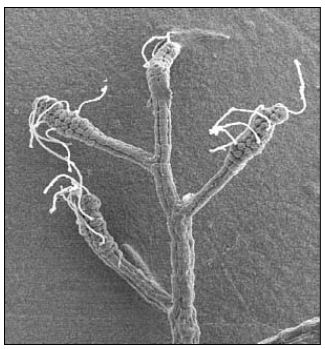


Male spermatangial branch with spermatium (sp), each produced in a spermatangium



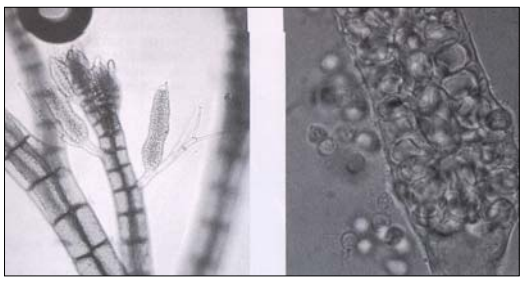
Female carpogonial branch (cb) with carpogonium (cp) at end

Gametophyte: carpogonium, trichogyne, spermatia…

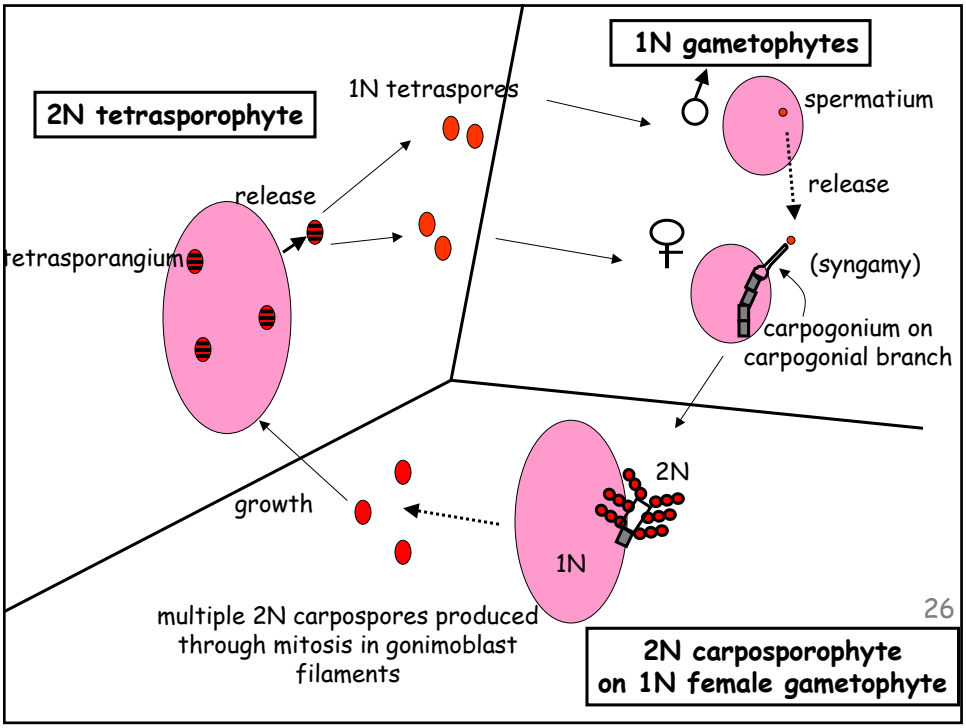


Female gametophyte

Polysiphonia



Male gametophyte



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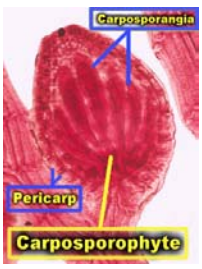
Some more new terms for red reproduction……

gonimoblast = filaments supporting carpospores in the carposporophyte.

carposporophyte = one of the 2N generations (all 2N material on the female gametophyte); this is where the 2N zygote goes through mitosis to form the carpospores

pericarp = 1N vegetative tissue that surrounds the carposporophyte

cystocarp = pericarp (1N) + carposporophyte (2N)



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Division: Rhodophyta

Class: Rhodophycea

Subclass: **Bangiophycidae** **Florideophycidae**

- "simple" reds
- unicells, filaments, blades; parenchymatous
- marine, terrestrial, freshwater
- uninucleate
- one stellate chloroplast per cell
- pit connections relatively rare; if present, only primary, and in 2N stage
- biphasic life history

- advanced reds
- always multicellular (filaments, psuedoparenchymatous blades)
- marine, freshwater
- almost always multinucleate
- many discoid chloroplasts
- primary and secondary pit connections
- triphasic life history