



HEALTH

Consumer claims seaweed is fake

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NAKHON RATCHASIMA : Provincial health officials are investigating a consumer complaint that dried seaweed sold at a supermarket is fake.

Housewife Boonyang Khamsungnoen displays a piece of allegedly fake seaweed believed to come from China. Mrs Boonyang said she found the product, bought at a Nakhon Ratchasima supermarket, very chewy and it took on the appearance of a plastic sheet when stretched after being soaked in warm water



Officials have collected samples of the dried seaweed from the shop and are testing them to see if they are made of plastic.

A recent media report raised suspicions fake seaweed made of plastic and imported from China was being sold in northeastern provinces.

Boonyang Khamsungnoen, 60, lodged the complaint after she found the dried seaweed products she bought at the supermarket were very chewy as if they were made of plastic or rubber.



The colour and smell of the products were remarkably similar to real seaweed, Mrs Boonyang said. She said she bought the seaweed for cooking and its unusual property became apparent when she soaked it in warm water.

When stretching it, the soaked seaweed looked like a plastic sheet and reminded her of the recent media reports about the fake seaweed products from China, Mrs Boonyang said.

When she inspected the packaging, she found there was no certification by the Food and Drug Administration.

Mrs Boonyang said she had decided to complain about the products because she wanted the provincial health office to prove if they were genuine for the sake of consumer safety.



07/01/08 Beijing

Uses Of Algae Throughout History

compiled by Dr. Erik-Jan Malta

- ancient reference to algal biofuel:
- According to Jewish tradition you are not allowed to use "the green (thing) from the water" to boil the oil lamp for Sabbath. (which shows that it was a custom to use it).

- There is evidence for the exploitation in antiquity of the halophile *Dunaliella salina*, which grew naturally in salt evaporation ponds. Only exploitation of the same organism, in the second half of the twentieth century, provides the scientific knowledge to understand for the first time an empirical Roman technology. Production in antiquity was on a commercial scale to provide glycerol as a solvent for use in the perfume industry. In addition, references in antiquity, by Dioscorides, Pliny the Elder and Galen, give a mush of dead *Dunaliella salina* medical uses."
- Longhurst, I. 2007. The Identity of Pliny's Flos Salis and Roman Perfume. *Ambix* 54 (3): 299-302

- that according to the *Bellum Africanum* (45 BC) the ancient Greek in dry periods collected seaweed, washed it with fresh water and fed it to their cattle
- - according to an Icelandic saga (950 AD) Egil Skalla Grímsson was fed *Palmaria* to get him to drink milk when he was on a hunger strike
- - St Columba (Ireland) is told to have collected *Palmaria* to feed the poor around 550 AD

- · In *Bellum Africanum*, written in 46 B.C., is written "The Greeks collected seaweed from the shore and having washed it in fresh water, gave it to their cattle." Of course, under the term seaweed could be meant here also leaves and rhizomes of seagrass *Posidonia*!!
- · In addition, there is a Greek word "phtiasidi" (=cosmetics in Modern Greek) that comes from "phyciasidi" (phycos + end idi, ancient Greek) which means cosmetics that were produced from seaweeds, algae, phycia.
- · Seaweeds in Elounda of Crete are considered as sacred and they selected during Jesus Commitment day for health and family stability.

MARINE PLANTS

- Members include seaweeds, sea grasses, mangroves, marsh grass, microscopic algae.
- they are eukaryotic
- contain organelles enclosed by a membrane
- photosynthesis takes place in chloroplasts--green, brown, or red organelles.
- lack flowers, roots stems and leaves.

MARINE PLANTS

- While most are referred to as plants, some have flagella and show animal characteristics...and some are actually claimed by both botanists and zoologists as theirs!
- Taxonomically, a compromise has placed them in the Kingdom Protista...the unicellular forms.





MARINE PLANTS

- **Seaweeds**...dominant marine plants containing chlorophyll and additional pigments from blue to red.
- Seaweeds are all eukaryotic and most are multicellular.
-

MARINE PLANTS

- But some that are unicellular or simple filaments are considered seaweed because the classifications of seaweeds is based not only on structure,
- but also on other features such as types of pigments and food storage products.

MARINE PLANTS

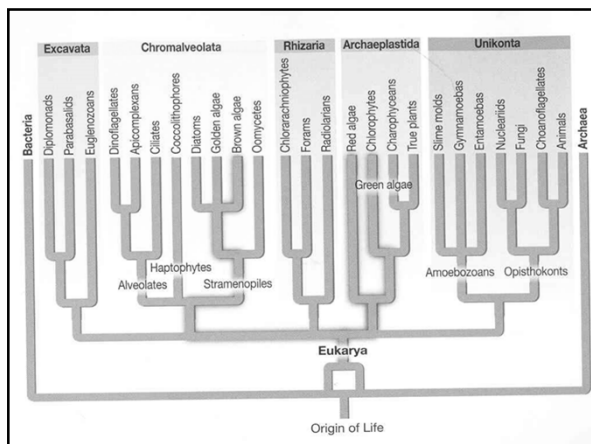
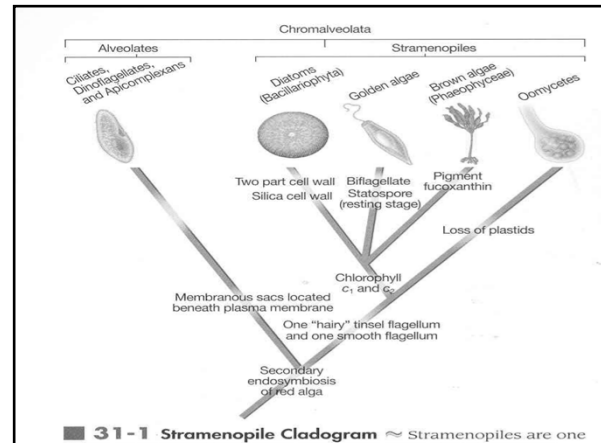
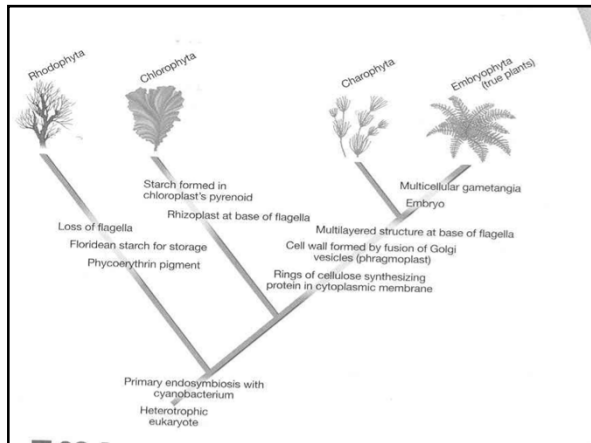
- **Classification** characteristics used to classify are;
- ① form which starch is stored
- ② composition of cell wall
- ③ presence of motile cells with flagella
- ④ level of complexity
- ⑤ sometimes, reproductive patterns (reds)





MARINE PLANTS

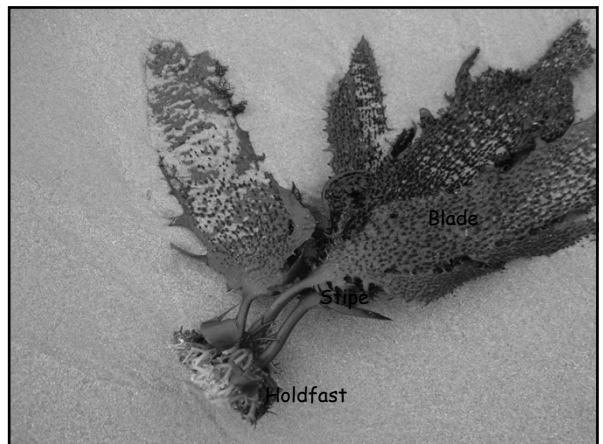
- Red Algae is Rhodophyta
- Green Algae is Chlorophyta
- Brown Algae is Phaeophyta

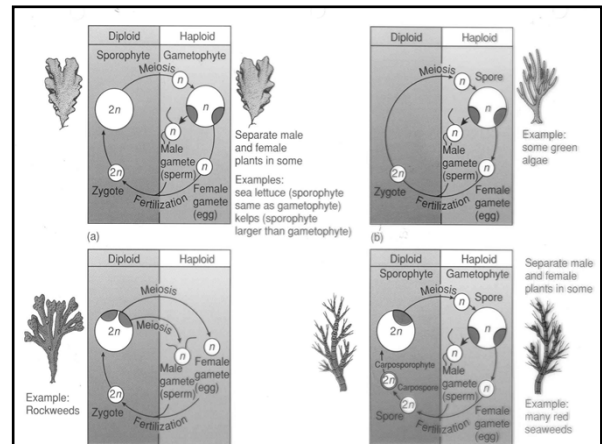
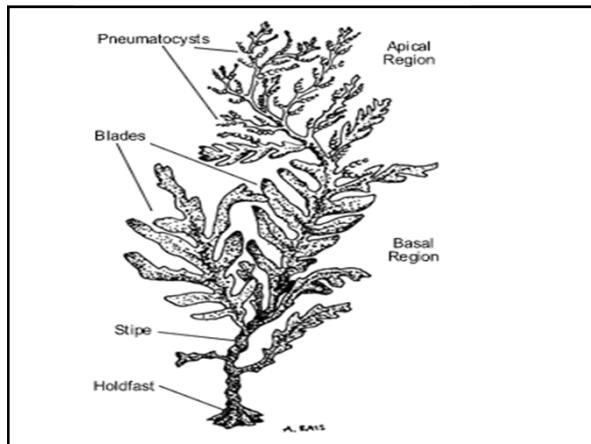




MARINE PLANTS

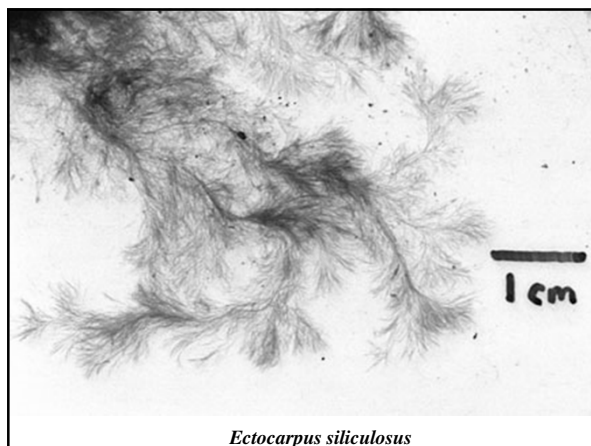
- Algae are **Thallus**, meaning they lack true roots, stems, and leaves, fruits, connecting tissue etc. and
- photosynthesis occurs throughout the plant, not just the leaves.
- Parts: Holdfast, stipe, blade, air bladders (pneumatophores).
- (list functions)





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- **Brown Algae.**
- **Phaeophyta**..microscopic to 60' make up the largest and structurally most complex.
- Colors range from olive green to dark brown, due to yellow pigments fucoxanthin dominance over chlorophyll.



Ectocarpus siliculosus



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Pigments are xanthophyll and carotene and chlorophyll.

The simplest brown algae have a finely filamentous thallus as in *Ectocarpus*.

There is the fan shaped *Padina*.

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■ Many species of brown alga are found in the intertidal zone and known as rockweeds and in deeper areas of the cool coastal zones are the kelps, the largest and most complex of all brown algae.

MARINE PLANTS

As mentioned before, kelp plays an important role in the coastal production with many organisms finding homes around the kelp beds.

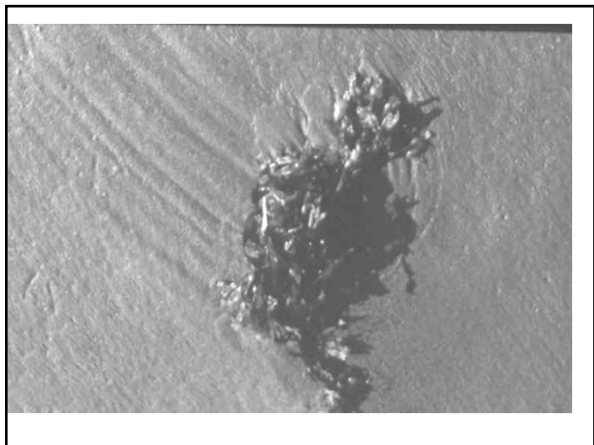
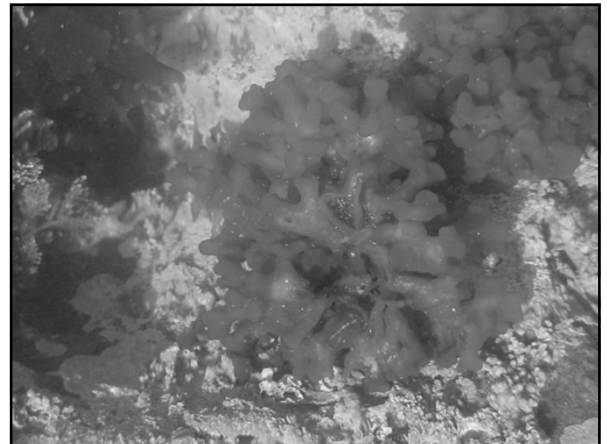
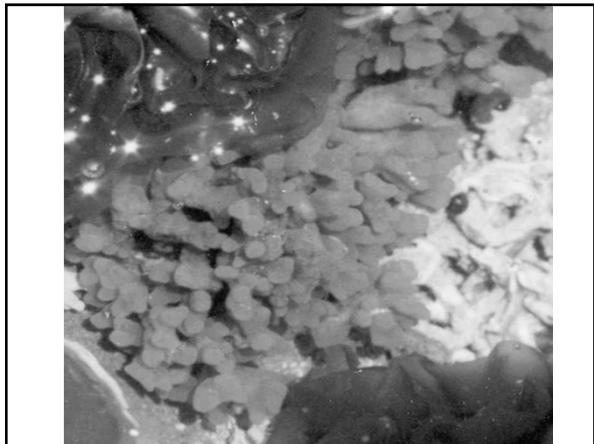
Some kelps consist of a single blade, *Laminaria*, which are harvested for food.

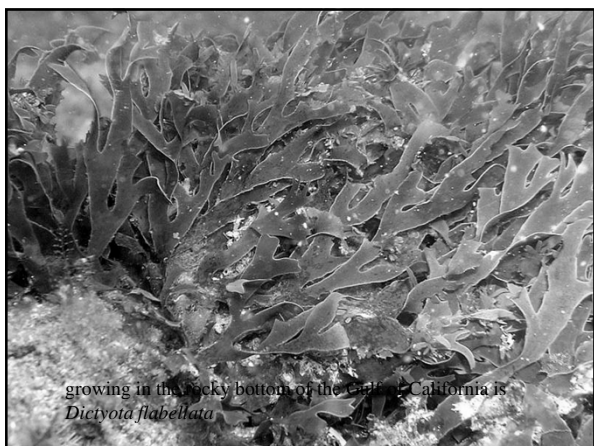
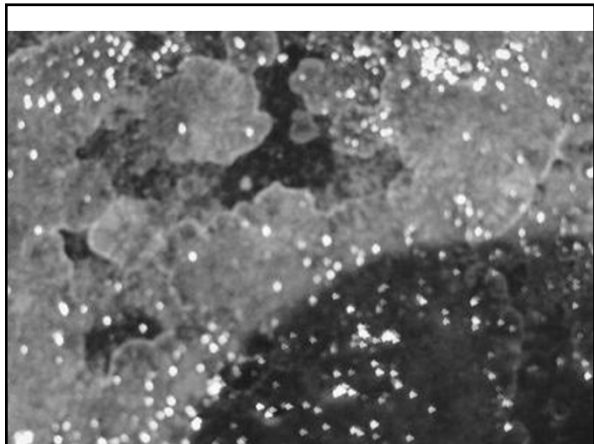
Kelps have been estimated to grow up to 50 cm (20 inches) per day.



Kelp at Elands Bay, South Africa (west coast) (wavescape)







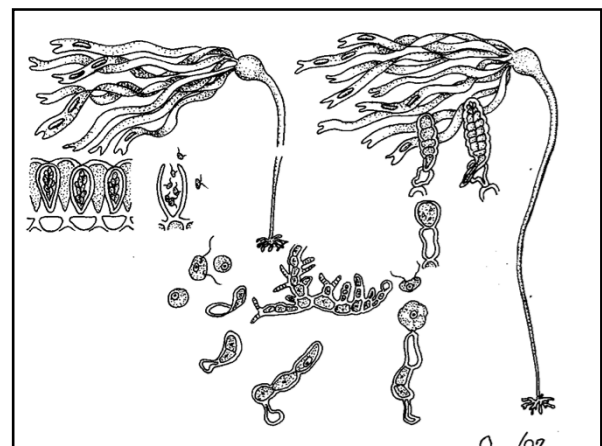
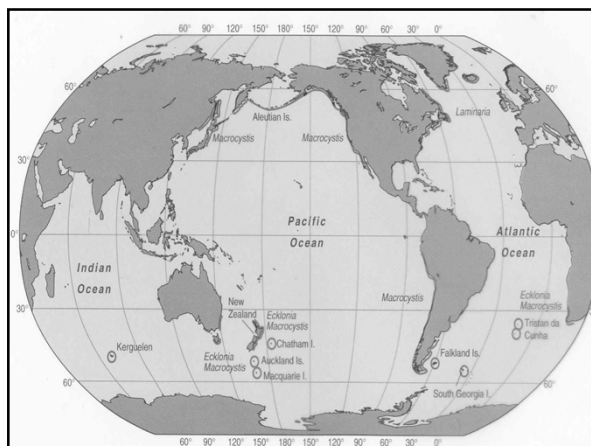
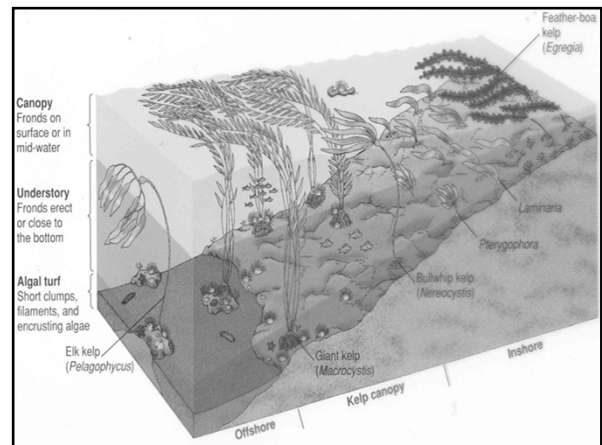
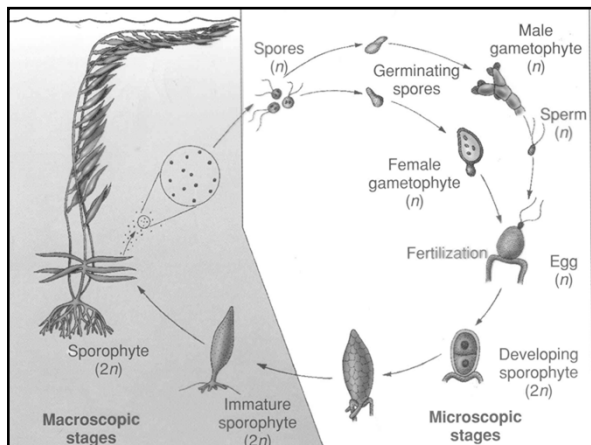
MARINE PLANTS

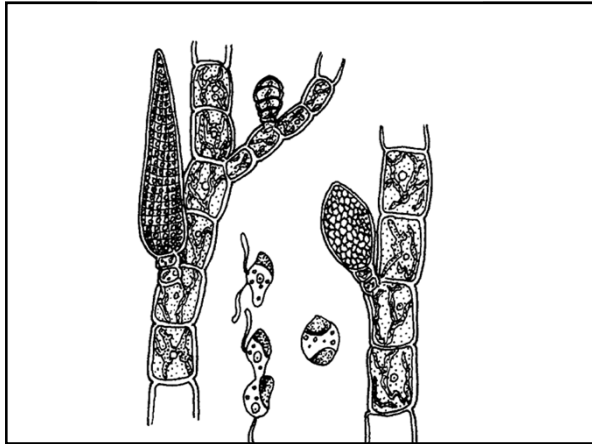
Alginic Acid, a gummy, slimy layer in cell wall, is used as an emulsifying agent (algin)..(Know uses) (algae Readings)

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Brown algae...Nereocystis (bull kelp).
The kelp is the sporophyte or diploid phase and

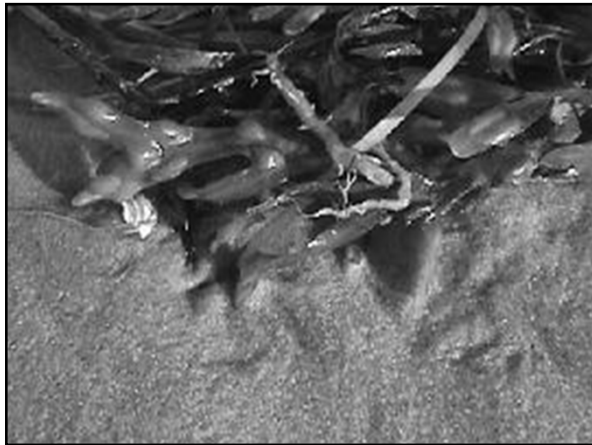
1. certain areas of the fronds (sori) become darker
2. meiosis occurs and haploid zoo spores are formed.
3. They settle to the bottom and grow into microscopic gametophytes.





MARINE PLANTS

4. The female produces eggs but holds them and the male produces sperm which are released and
 5. attracted to eggs, fertilize them and
 6. zygotes are formed which germinate into the sporophyte plant.
- Kelp (how are chances for fertilization increased?) ...Fucus, another brown algae or rockweed, is again, like animals where the



MARINE PLANTS

1. diploid plant forms gametes through meiosis
 2. fertilization occurs
 3. the zygote immediately germinates back to the sporophyte
- Gametes are produced in cavities called CONCEPTACLES.

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Red Algae

Rhodophyta has more species of these than green and brown combined.

It has the highest commercial value, and don't get as large as brown algae.

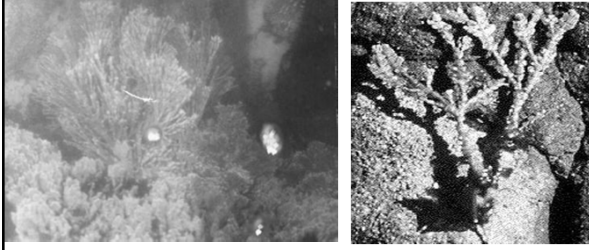
- ⊗ absence of flagellate stages
- ⊗ presence of other pigments mainly phycobilins

MARINE PLANTS

- ⊗ Floridean starch as food reserve (scattered throughout cells)
- ⊗ Existence of special female cells (carpogonia) and male gametes (called spermatia) for sexual reproduction.
- ⊗ Cell walls with inner rigid component and outer mucilage or slime layer. This is like the alginates and very valuable.

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They can also deposit calcium carbonate (lime) into the walls of some species (Coralline algae) (Coralline algae)

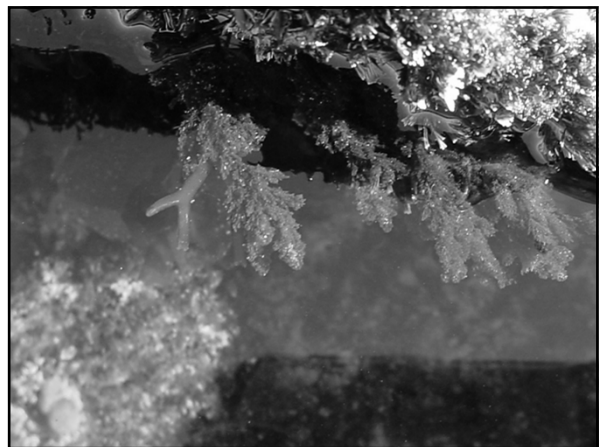
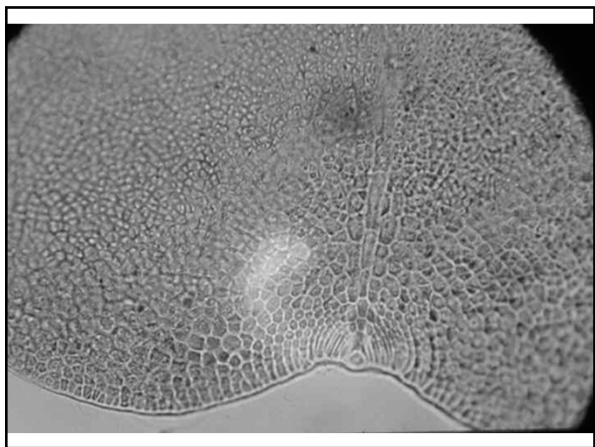
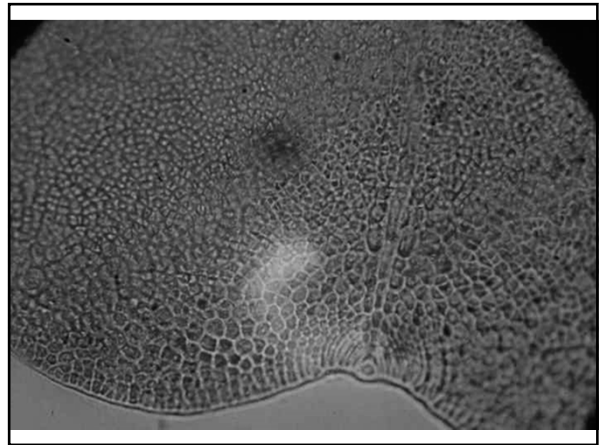
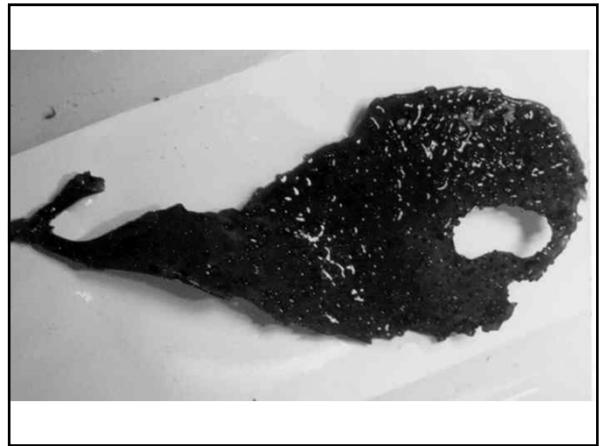
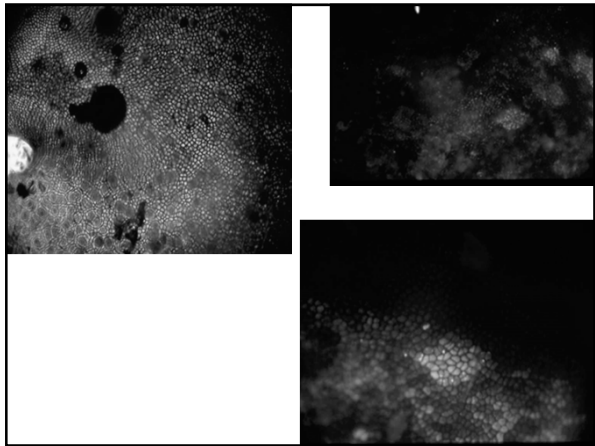


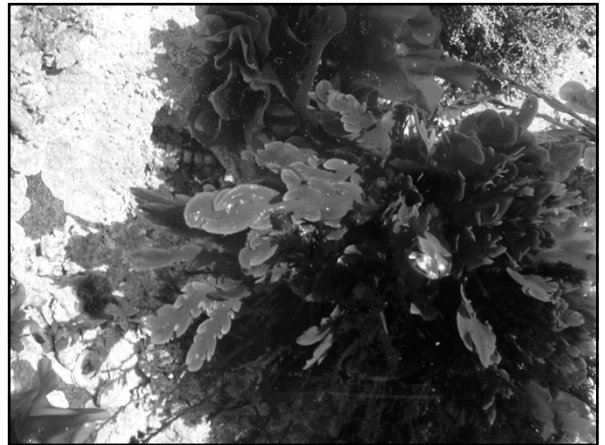
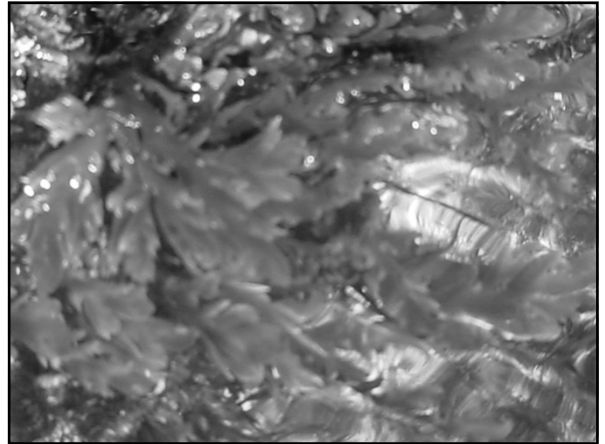
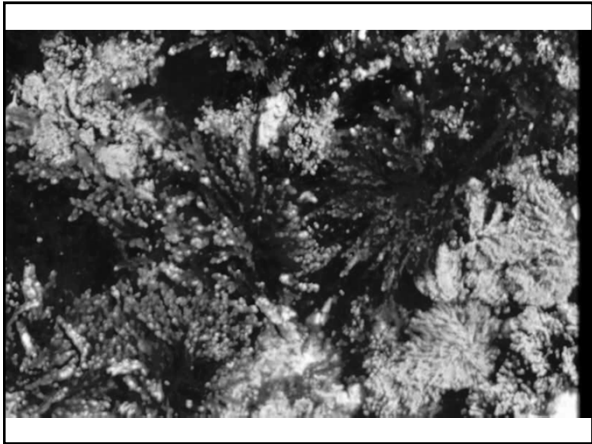
MARINE PLANTS

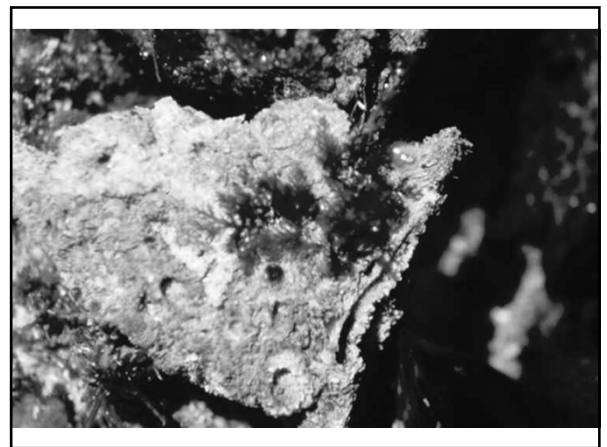
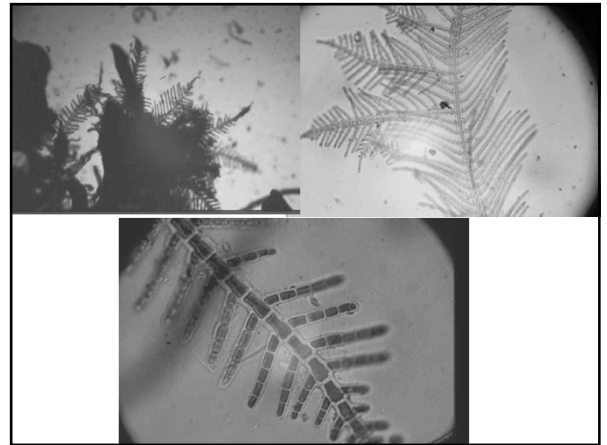
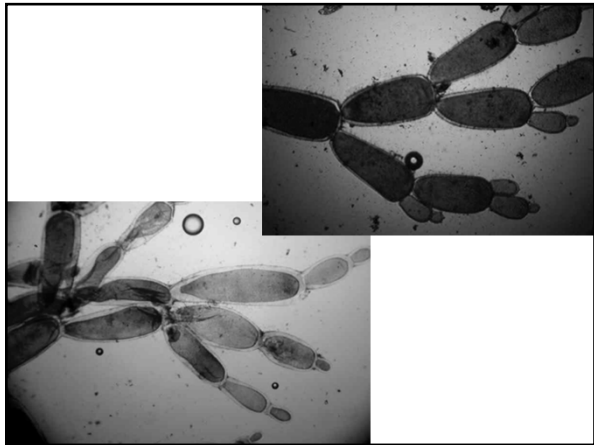
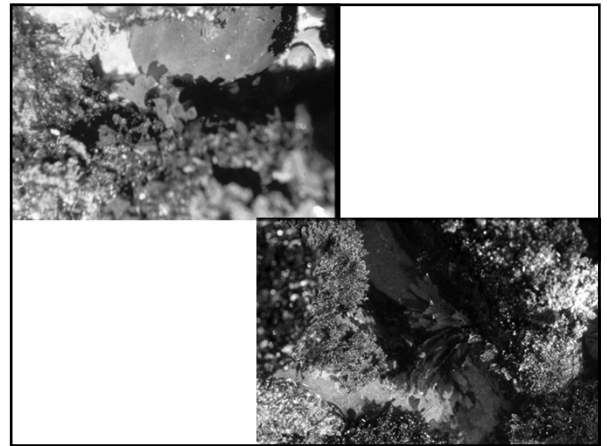
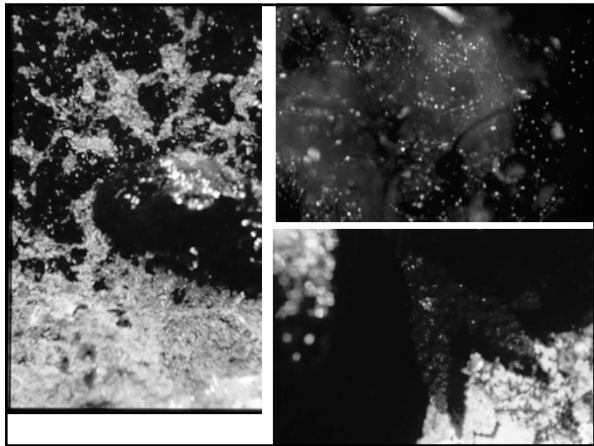
- The structure of the thallus of red algae does not show the wide variation in complexity and size that is observed in brown algae.
- Most reds are filamentous but thickness, width and arrangement of the filaments vary a great deal.
- There are many variations in the shapes, sizes and colors of the reds.

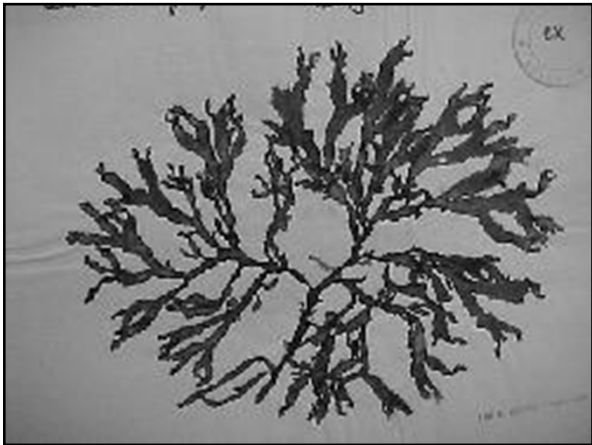
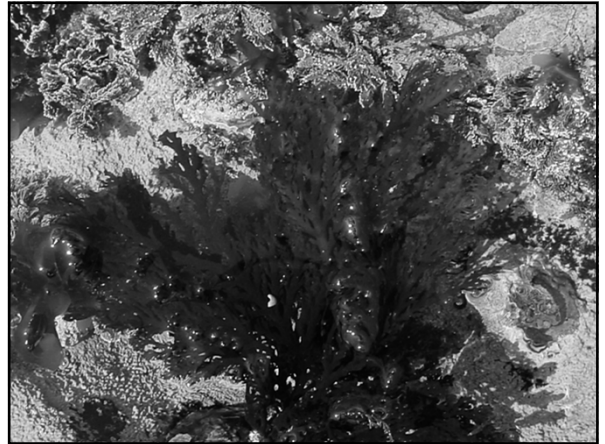
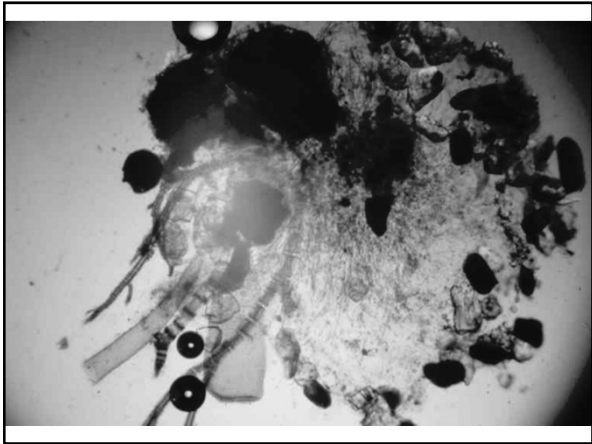
MARINE PLANTS

- One important in marine environments are the red alga Corallines.
- These are characterized by deposits of calcium carbonate around their cell walls.
- These can be encrusting on the rocks or articulated, branching plants, with colors from light to reddish pink-white when dead.



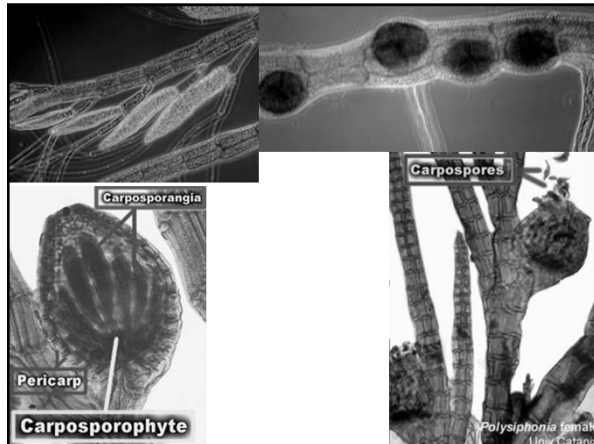






MARINE PLANTS

- Warm water corallines are active in reef development.



MARINE PLANTS

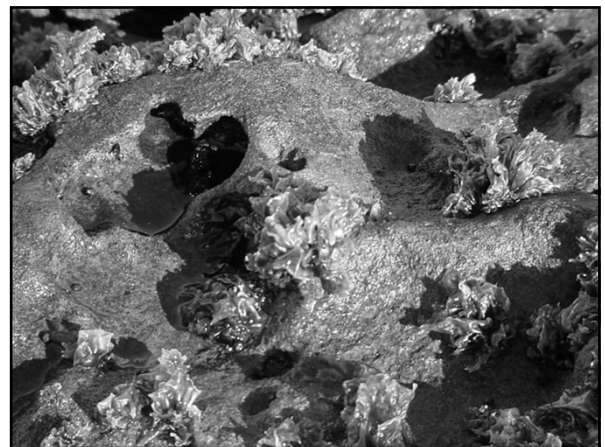
1. Sporophyte produces tetrasporangia (site of meiosis) which produce 4 haploid tetraspores.
2. Gametophytes grow from the spores and their gametes (spermata and carpogonia) fuse and
3. are retained and develop into a special mass of diploid cells (the carposporophyte)

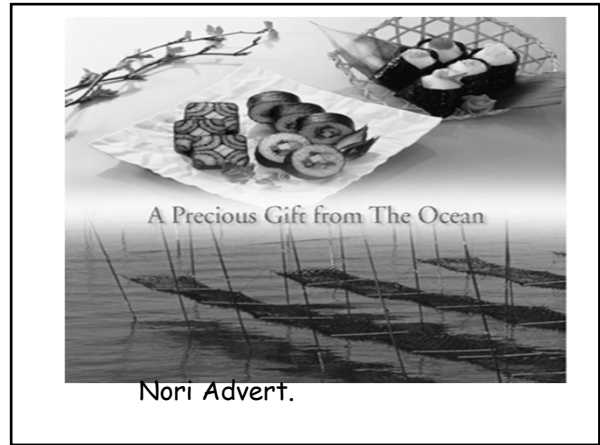
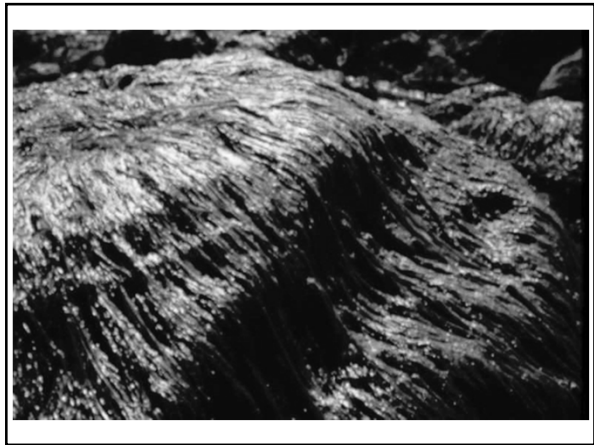
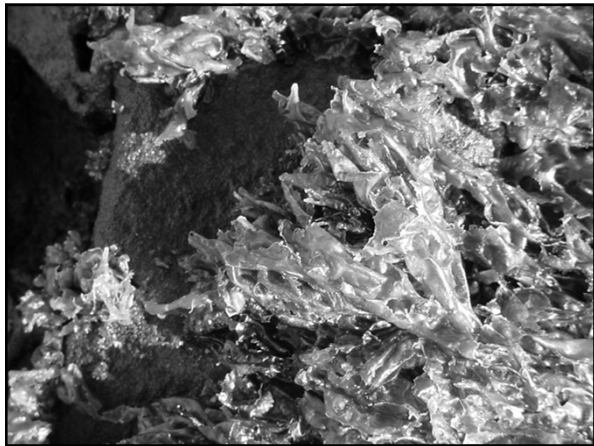
MARINE PLANTS

4. which breaks up into many carpospores (diploid) and
5. these grow into a sporophyte generation which resembles the gametophyte (isomorphic) and..(go to 1)

MARINE PLANTS

Red algae Porphyra or Nori is a valuable food source but has an atypical life history with the gametophyte being the large leafy plant and the sporophyte being the tiny "conchocelis" found living in discarded shells. The Typical red cycle is that of Polysiphonia.





MARINE PLANTS

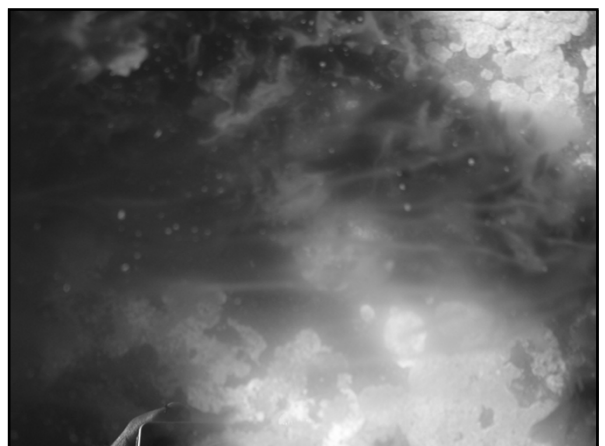
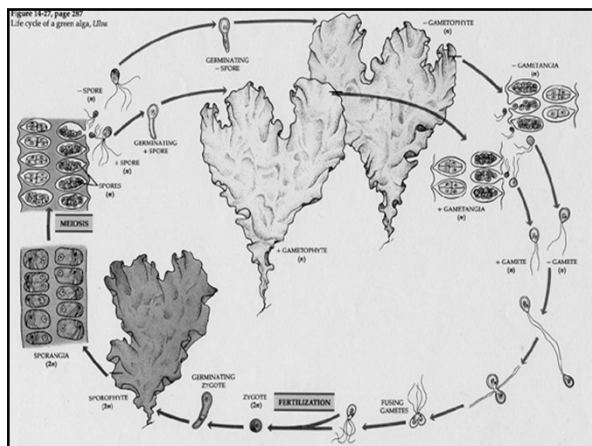
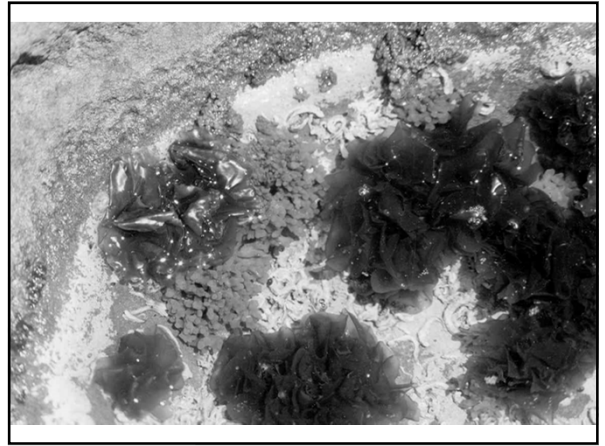
Green Algae

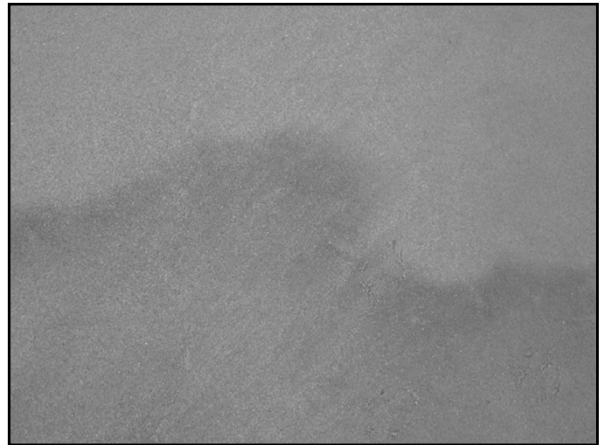
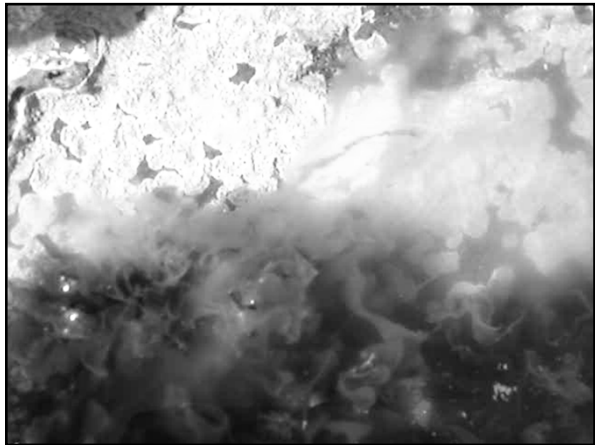
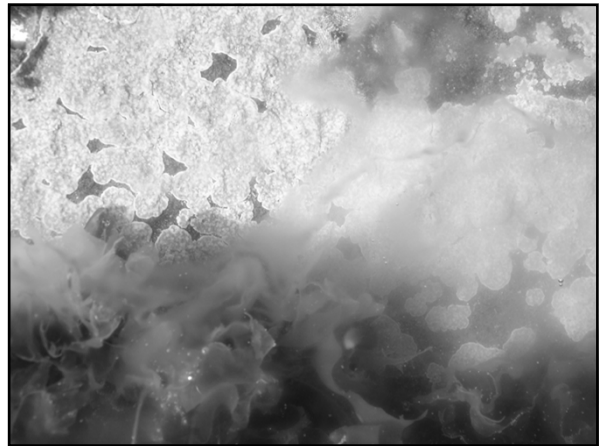
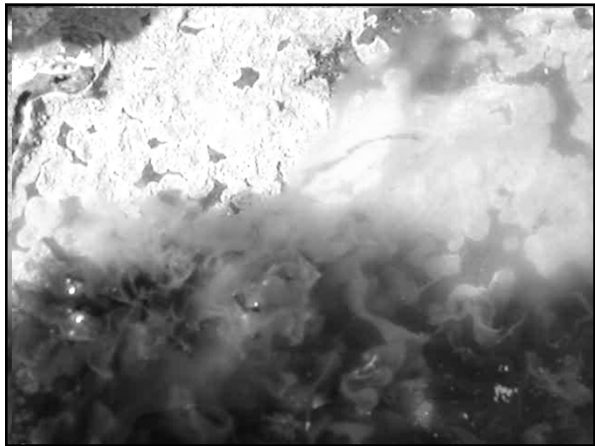
CHLOROPHYTA. The great majority of green algae are restricted to fresh water and terrestrial environments.

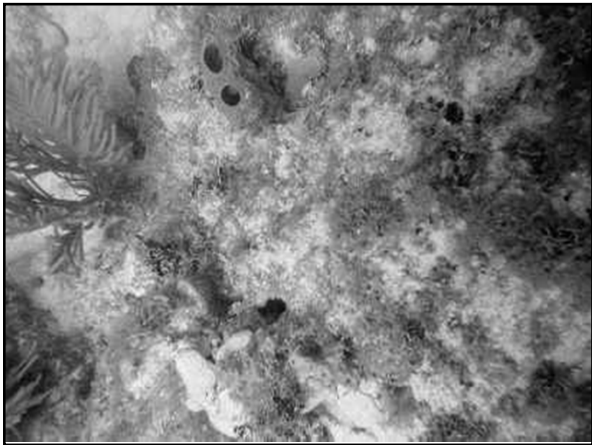
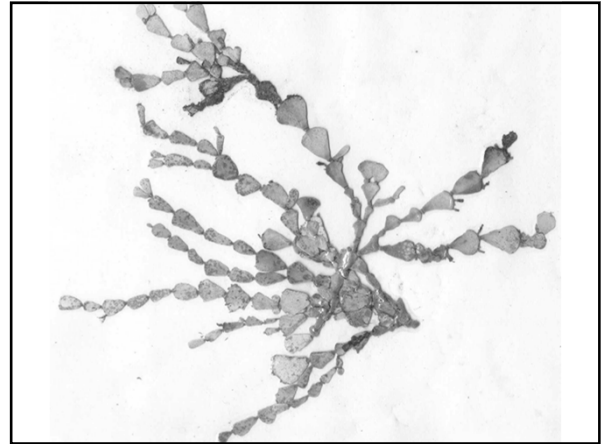
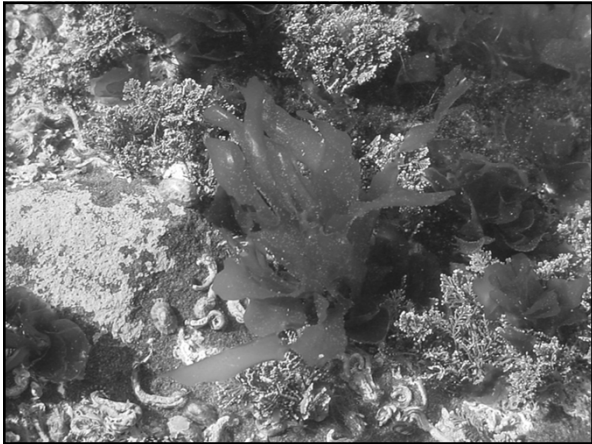
Only 10% are marine but they are dominant in environments with wide variations in salinity such as bays and estuaries, tide pools (sewage outfalls) .

MARINE PLANTS

- These are the stock from which land plants derived and in full agreement in regards to pigment, starch, cellulose etc
- May exist as single cells, simple or branched filaments, blades, organized into tubes that are intertwined and usually grass green in color.





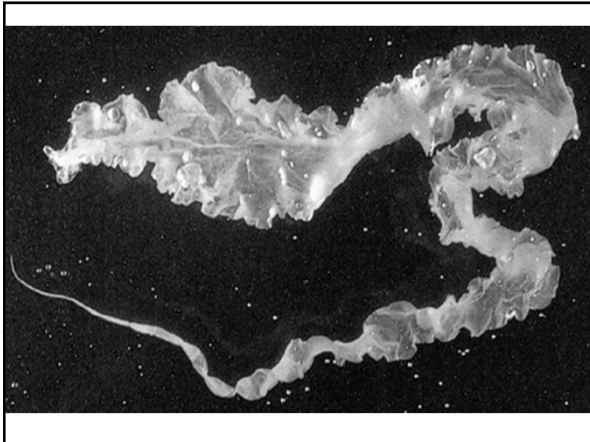


MARINE PLANTS

- Few green algae are as complex as the other groups but their pigments and food reserve are the same as in higher plants. (evolved from green algae.)
- Chlorophyll b in green and land but not other algae).
- They are unicellular, filamentous multicellular, shapes can vary in the same species according to their environment.

MARINE PLANTS

Enteromorpha is a thin hollow tube, Ulva, sea lettuce is leafy-like, Valonia, forms huge spheres /clusters of them in tropical waters., some branch and Caulerpa and Cladophora have tubes with many nuclei, spongy, branching thallus Codium and segmented with deposits of calcium carbonate in their walls to ward off predators but



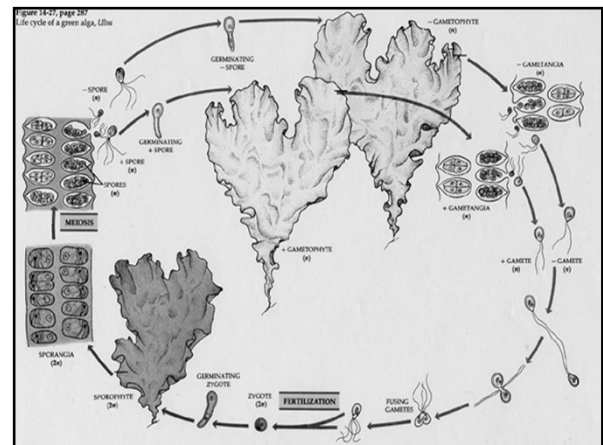
MARINE PLANTS

end up cementing the reef together in reef areas...Halimeda... a Coralline green algae!

Life Histories of seaweeds involve an alternation of gamete producing phase (gametophyte) and spore producing phase (sporophyte).

MARINE PLANTS

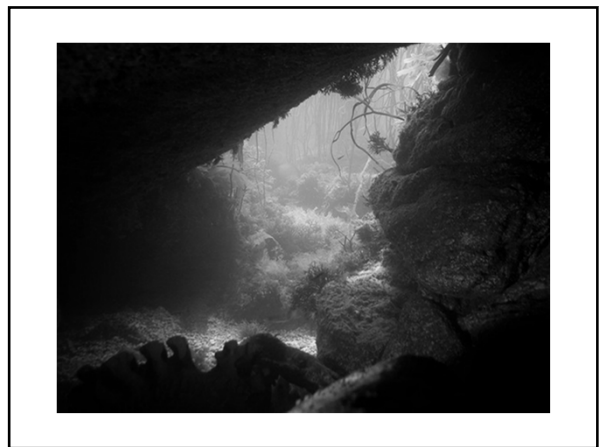
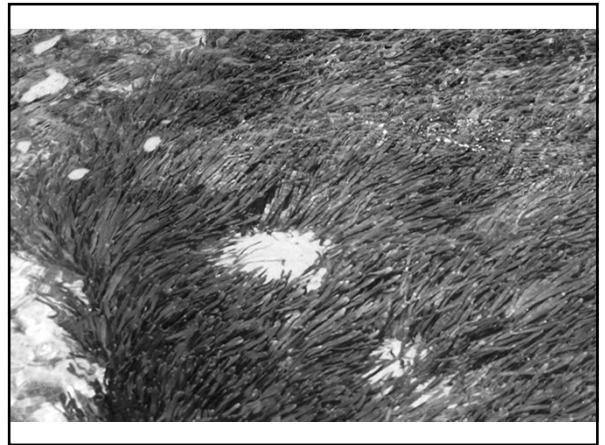
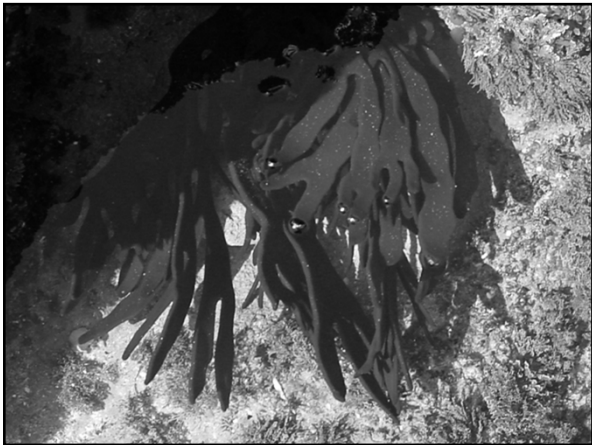
Green algae...Ulva (sea lettuce) have two identical phases. 1. Sporophyte (diploid) produces flagellated zoo spores (haploid) (meiosis) and these 2. swim briefly and settle on the bottom and 3. grow into a gametophyte phase (male or female) and produce motile gametes which 4. fuse to form zygotes (diploid).



MARINE PLANTS

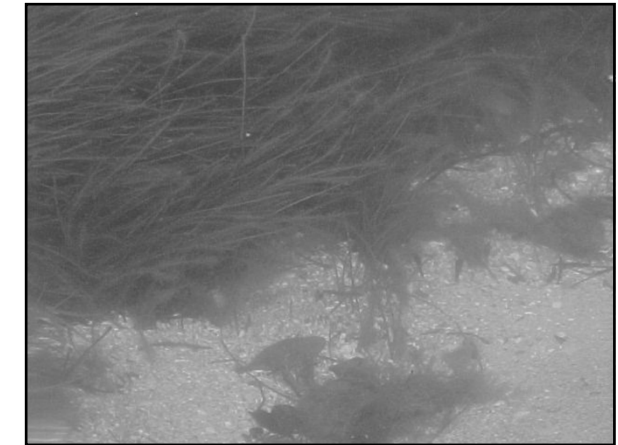
Codium, another green algae is more like animals and produces gametes by meiosis which fuse and form a zygote and grows into the familiar plant.





MARINE PLANTS

Marine Angiosperms (flowering plants)...few occur in the marine environment but those that do are usually very productive and adapted for their lifestyle. Of the 3 groups, mangroves, marsh grass and seagrass, only the sea grasses are adapted to live completely submerged in water. Pollination occurs under water.

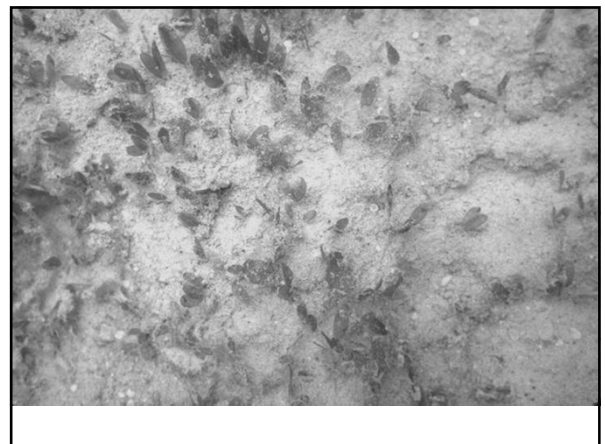
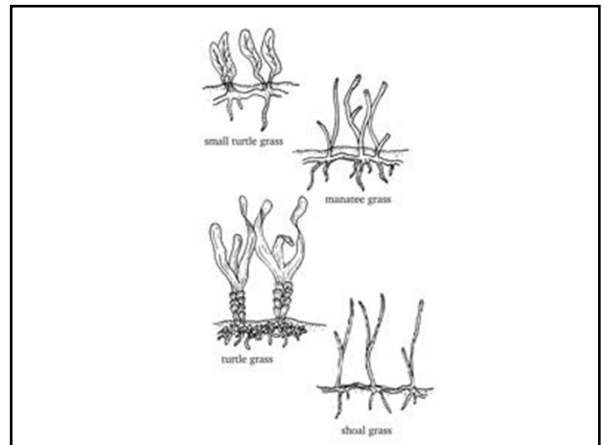


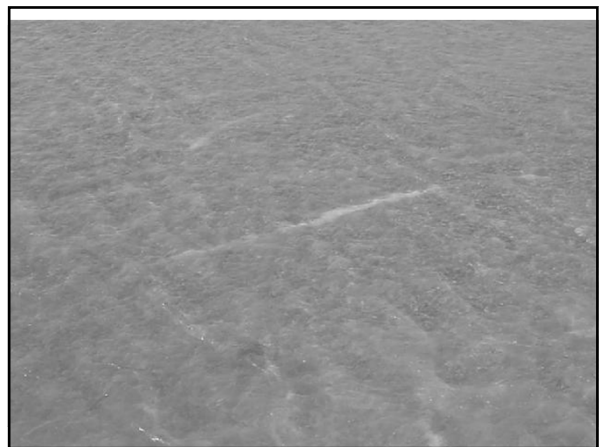
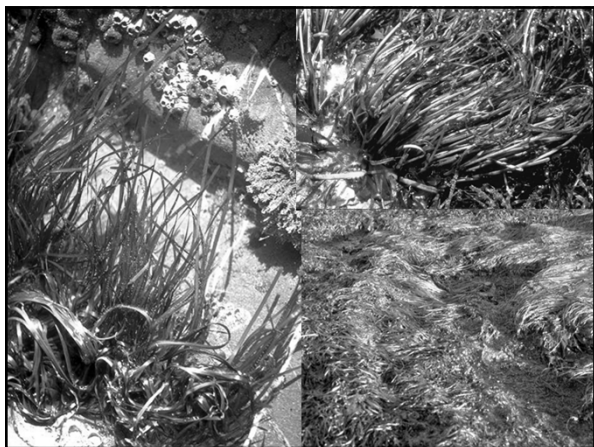
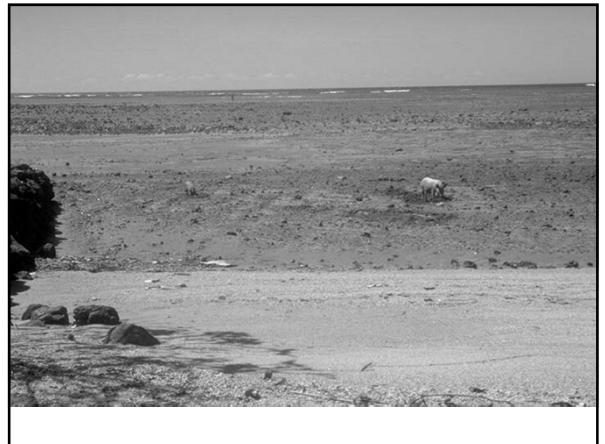
MARINE PLANTS

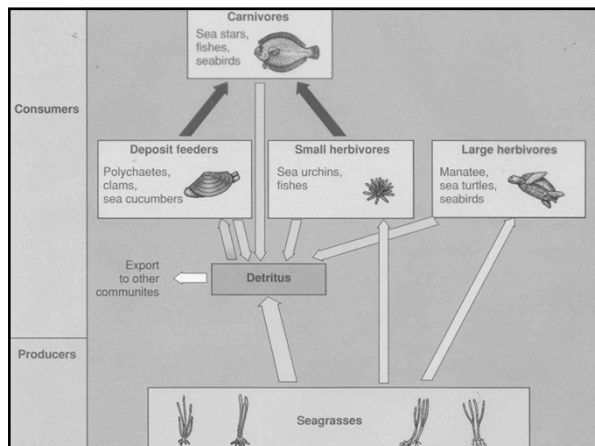
Seagrasses are not grasses, and their closest relatives are probably lilies. Pollen is carried by water currents and seeds are dispersed by water currents and feces of fish and other animals that browse on the plants. Eel Grass (*Zostera*) is the most widely distributed of the 50 species and found in shallow, well-protected coastal waters such as bays and estuaries.

MARINE PLANTS

It has distinct flat ribbon like leaves. Surf grass (*Phyllospadix*) is on rocky coasts exposed to wave action. Turtle grass (*Thalassia*) is common in the keys. (Manatee Grass (*Halophila*)).







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Mangroves..80 unrelated species of flowering plants adapted to various ways to survive in the salty environment. Mangroves have a special root system using aerial roots to ventilate the system below the substratum (especially in anaerobic mud and under water).

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The three types of mangroves found in Florida include the Red Mangrove (*Rhizophora mangle*), the Black Mangrove, (*Avicennia germinans*) and White Mangrove, (*Laguncularia racemosa*). These are found along the estuaries, canals, and form islands.

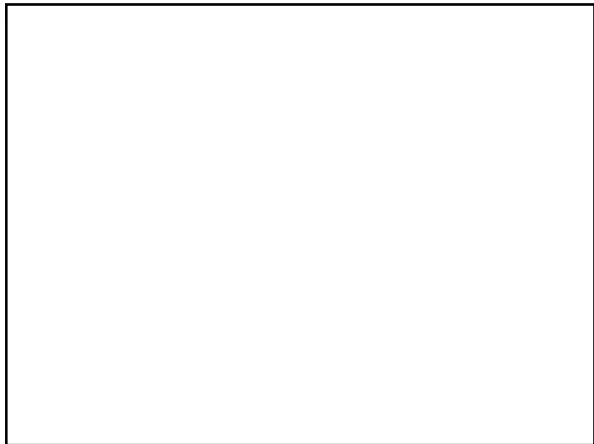
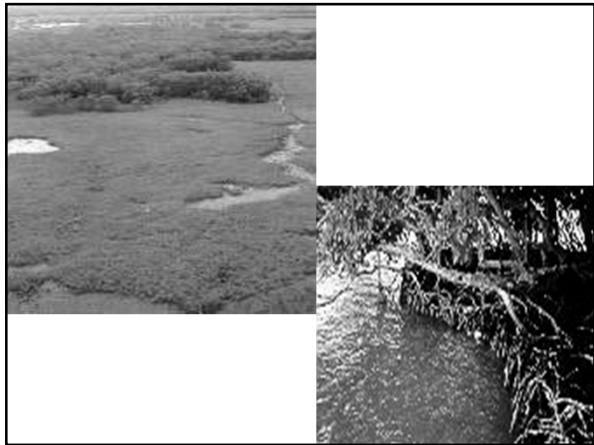
MARINE PLANTS

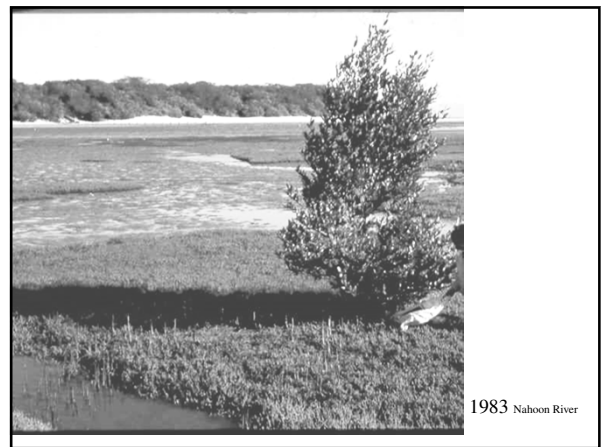
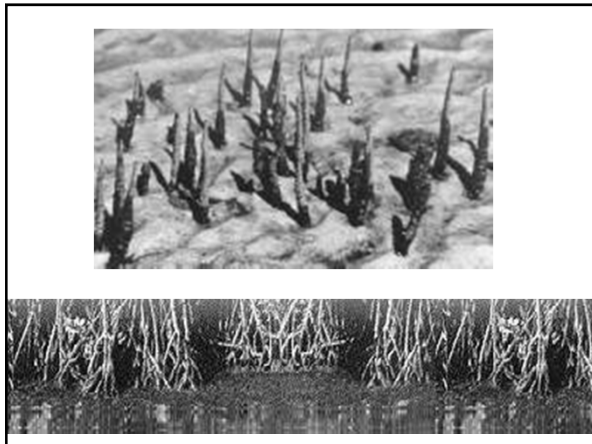
The term "Mangrove" is applied to a diverse group of tropical salt tolerant trees which are abundant in south Florida and the Florida Keys. These trees have been able to successfully occupy coastal environments where they have little or no competition from other species of plants.

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In order to do this, the mangrove trees have had to cope with a number of problems including soft, oxygen-poor soil, periodic flooding of their root zones and a highly saline environment.







1983 Nahoon River



MARINE PLANTS

Some genera have seeds that germinate on the parent plant and drop as seedlings rather than seeds.





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Saltmarsh plants, true members of the grass family, usually consists of succulent shrubs and herbs and grass-like species which can tolerate large salinity fluctuations. Cord grass inhabits the zone above the mud flats and can be submerged, and have salt glands to get rid of excess salt. Halophytes are found in higher levels of the marsh (pickleweed).



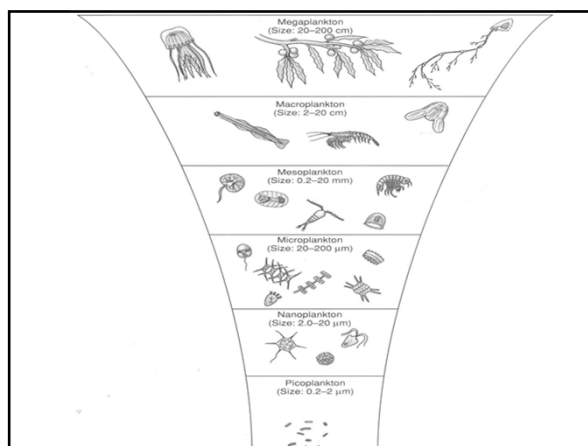


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Phytoplankton...plankton..Greek for wanderer meaning that they are passively transported. Nekton are those that swim. Size categories of plankton:

MARINE PLANTS

- ultraplankton: less than 2 μm
- nanoplankton: 2-20 μm
- microplankton: 20-200 μm
- macroplankton: 200-2000 μm
- megaplankton: greater than 2 mm



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Types:

Holoplankton...spend entire life in open waters

Meroplankton...spends part of life as plankton and part as a benthic or bottom dweller.

Tychopelagic...normally attached but break off and can then be found in the plankton.

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Divisions

Cyanobacteria (Cyanophyta) Blue-green algae (Monera)

■Chlorophyta green algae

■Chrysophyta golden algae/silicoflagellates

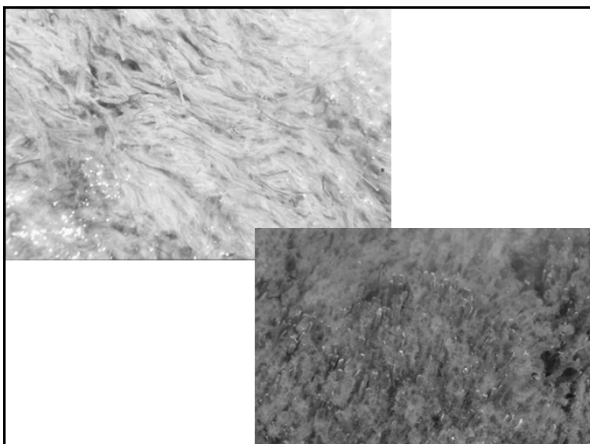
■Haptophyta- coccolithophores

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- Xanthophyta yellow-green algae
- Bacillariophyta diatoms
- Dinophyta (Pyrrophyta) dinoflagellates & zooxanthellae
- Cryptophyta cryptomonads
- Euglenophyta euglenas

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Division Cyanophyta/Cyanobacteria Blue green Algae are prokaryotic cells specialized to carry on photosynthesis. Chlorophyll, phycobilins, phycocyanin, beta-carotene and xanthophylls are the pigments so color range is great..red, blue-green, black, olive, yellow, violet. The only other prokaryotes that carry out photosynthesis are some autotrophic bacteria.



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There are chemosynthetic bacteria too that release stored energy in chemical compounds (H₂S). Blue-green algae contain a bluish pigment, **PHYCOCYANIN**. (Considered bacteria). Photosynthesis occurs on folded membranes within the cell (rather than chloroplasts).

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They do produce O₂ etc. and probably played a role in the oxygen in the atmosphere.

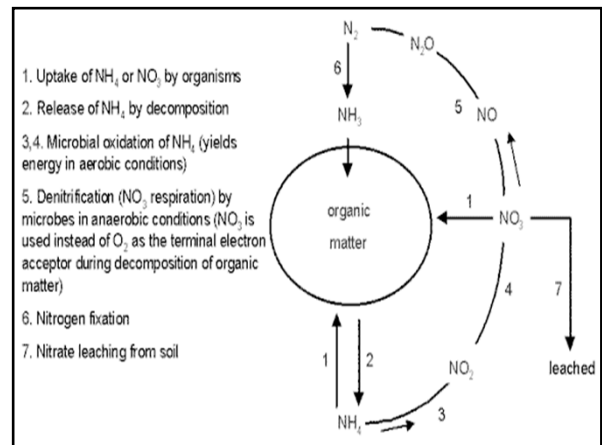
The presence of this ultraplankton is only being discovered .

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Responsibilities of blue greens include forming dark crusts along wave splashed zones , exploiting polluted sediments and even forming a few types of red tides (Trichodesmium erythraea).(skin rashes).

MARINE PLANTS

Blue-greens also carry out nitrogen fixation in the ocean, converting N into nitrates to be converted to proteins. Some blue-greens live on the surfaces of seaweeds and sea grasses (epiphytes) and some are known to lose their ability to photosynthesize, becoming heterotrophs.

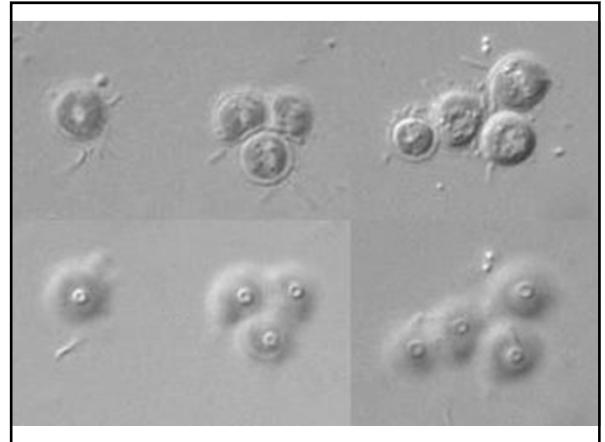
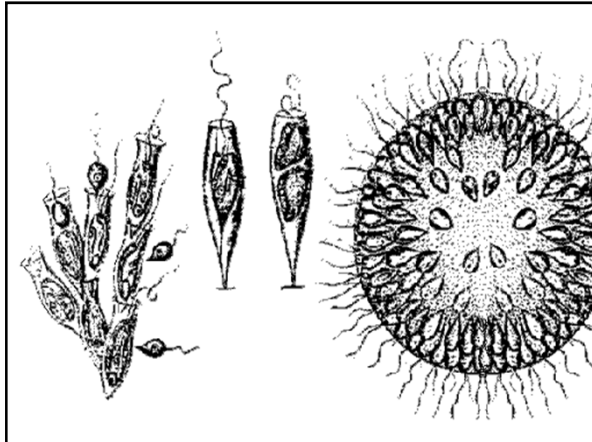


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Chlorophyta..few marine planktonic reps. but lots of macroscopic, benthic types

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Chrysophyta...golden/yellow color because in addition to chlorophyll. a & c there is a dominant carotenoid, fucoxanthin and many members have a cell covering of small siliceous scales. The silicoflagellates have an internal glass skeleton. Rare today.Characterized by star shaped internal skeleton made of silica and a single flagellum.

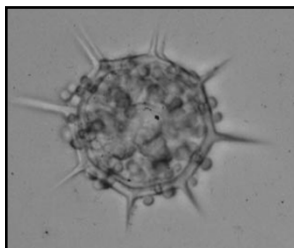


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Silicoflagellates are one of the lesser known types of photosynthetic protists found in the oceans. They are prominent because of their bizarre "skeleton" which consists of a rigid flattened basket of hollow tubes. Two to 8 spines project radially from the central basket. Because the construction of this skeleton is so robust, scientists can estimate abundances of this organism fairly easily.

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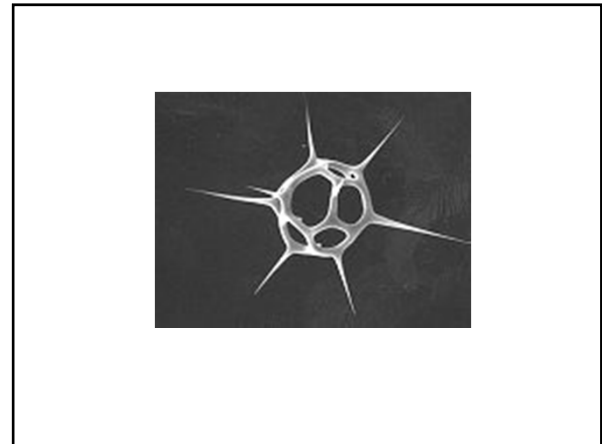
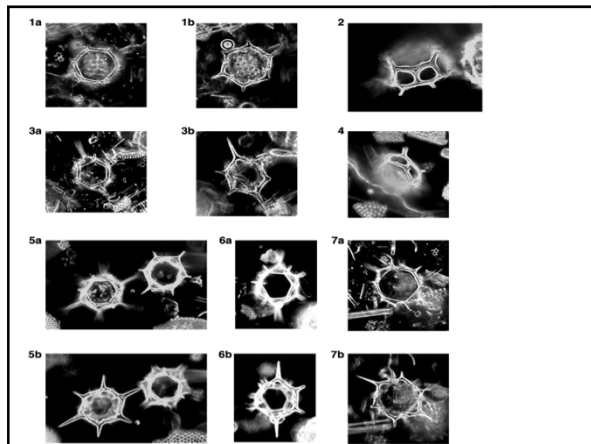
Fossils of the skeleton indicate that the diversity of silicoflagellates was once greater than the few species we have today. The cell itself is a lumpy bag containing golden-brown bodies (chloroplasts) that sits around the central part of the skeleton.



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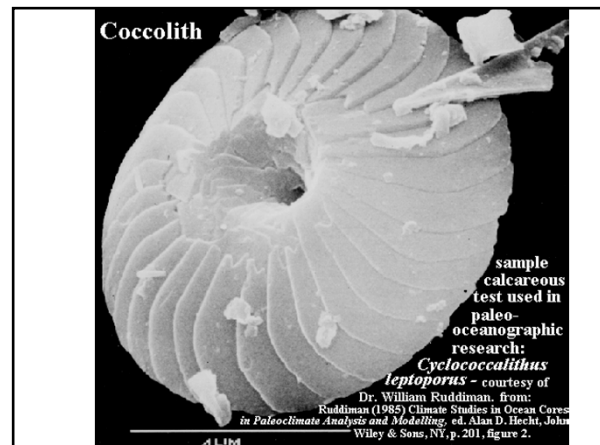
Where do they live?

Silicoflagellates are found in sun-lit zones of the ocean and are generally more common in colder waters. During winter they can be found closer to the tropics, but they retreat to cooler waters again in the warmer months. The distribution of their fossilised skeletons is used to help determine sea-temperatures in earlier ages



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Haptophyta.. or Coccolithophorids, flagellated spheric cells covered with button like structures called coccoliths made of calcium carbonate. This was broken off the above class because of different types of flagella. Phaeocystis forms gelatinous clumps, visible and can effect migration patterns of fish.



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■Coccolithophorales

1. *Emiliana huxleyi* - global distribution, bloom former, major player in marine phytoplankton
2. Thought to be largest global producer of calcium carbonate, hence major sink for CO₂.
- 3..

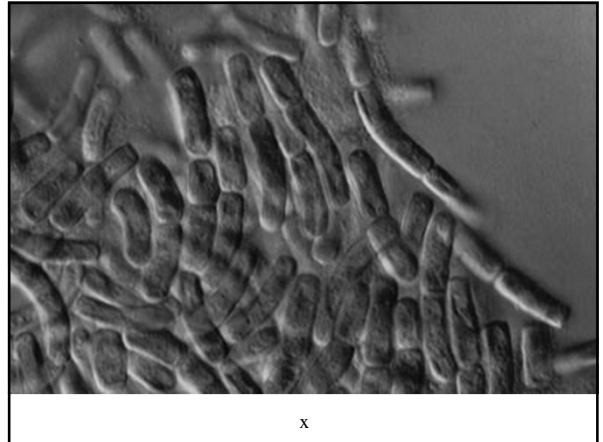
MARINE PLANTS

Also, blooms long ago followed by anaerobiosis, caused them to sediment and gave rise to oil deposits in the North Sea. The coccolithophores have small calcareous plates covering them and the patterns go way back in fossil records and are used by oil companies.

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Xanthophyta...like Chrysophyceae but have no fucoxanthin pigment. The Xanthophyta include more than 600 species. Members of this group are photosynthetic organisms which live primarily in freshwater, though some are found in marine waters, in damp soil, or on tree trunks.

Euglenophyta...euglena..class contains only unicellular flagellates, chlorophyll



MARINE PLANTS

Euglenophyta...euglena..class contains only unicellular flagellates, chlorophyll. A and B and a flexible cell covering...no wall!

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Fungi There are at least 500 species of marine fungi, most which are decomposers of dead organic matter. Some are parasites causing diseases in fish, shellfish, seaweed and sponges. Also some form associations with algae forming lichens and marine lichens may be found as thick, dark-brown/black or even orange patches on the wave splashed zones on rocky shores.



MARINE PLANTS

Bacillariophyta...diatoms...most important group in terms of primary productivity. The characteristic yellow-brown color is due to CAROTENOID pigments in addition to two types of chlorophyll (a and c). Half of the 12,000 species are marine. The brownish scum in a fish tank consists of millions of diatoms.

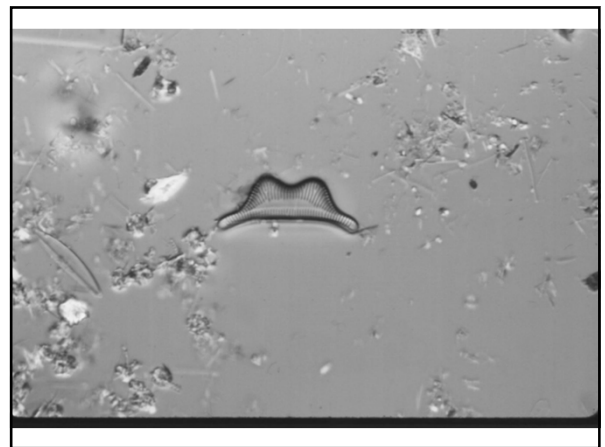
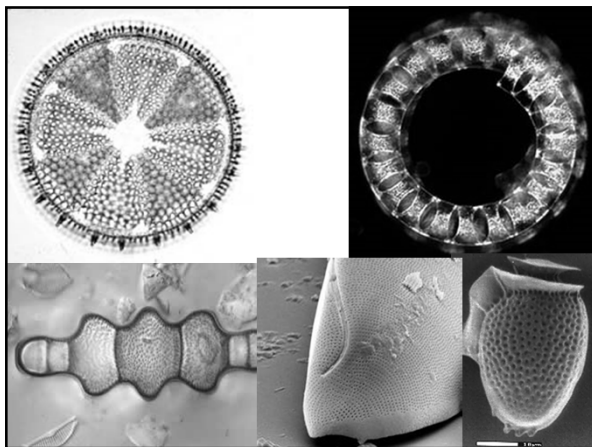
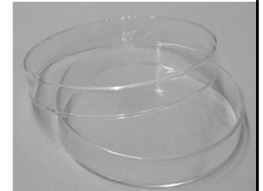


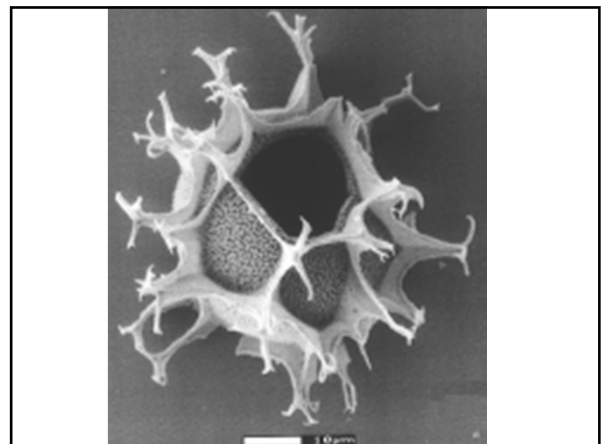
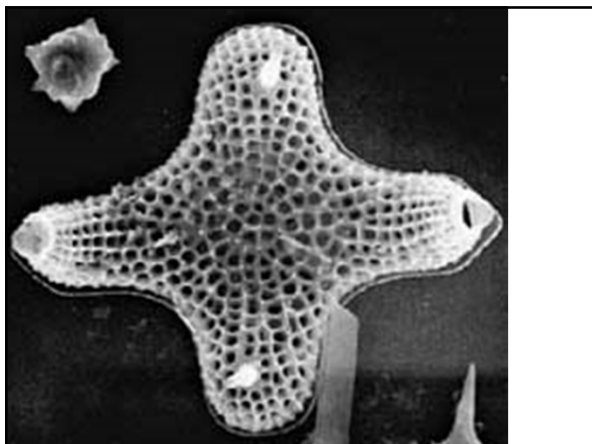
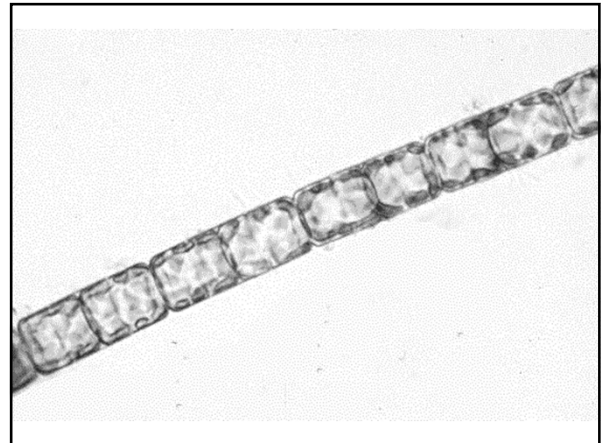
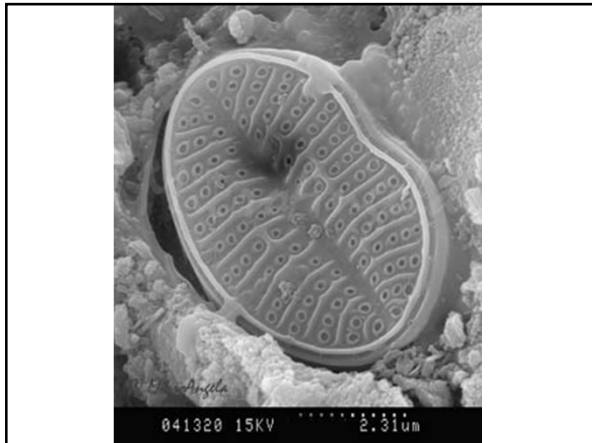
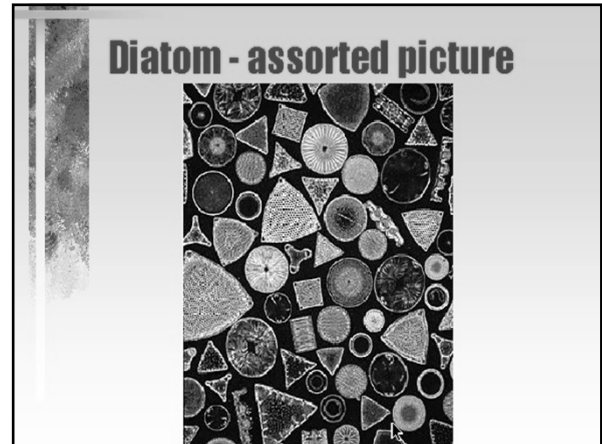
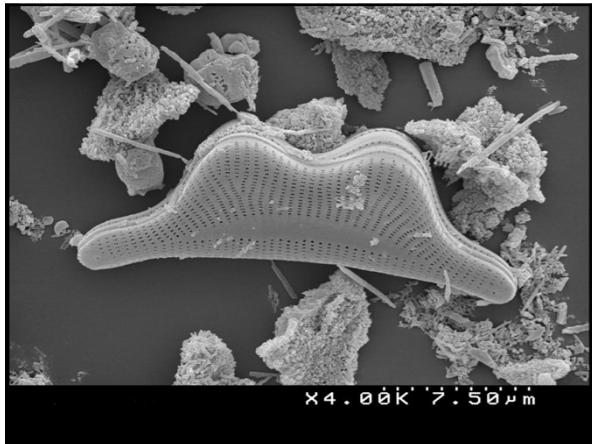
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- Diatom Characteristics
- 1. Usually unicellular but chains do occur
- 2. Pigments chlorophyll. a & c and fucoxanthin (gold/brown)
- 3. Food reserve is chrysolaminarin and oils (buoyant)
- 4. Only flagellate cells in reproduction (uniflagellate.)

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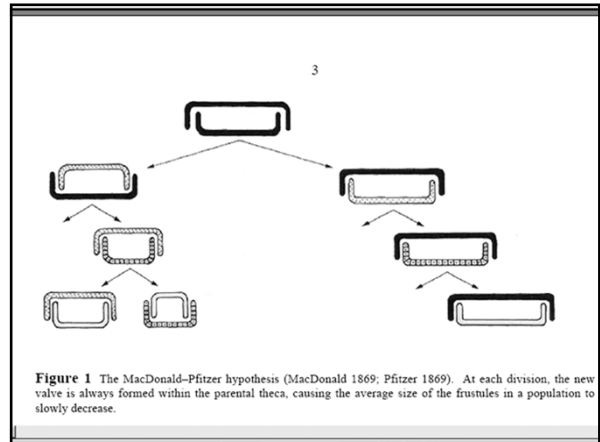
- 5. Walls made of glass called frustule.
- 6. Looks like petri dish
- 7. Two symmetries..radial and bilateral which divide diatoms into 2 sub-divisions..Centric & Pennates





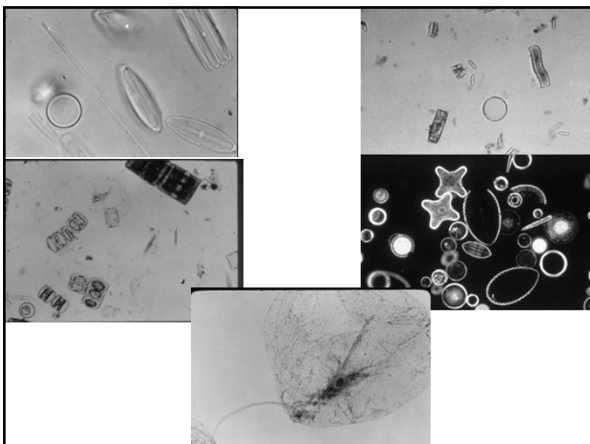
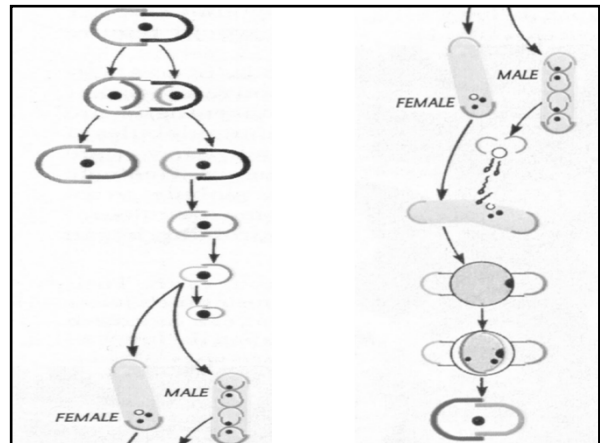
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Reproduction...valve to valve...one product of the division retains the parental epivalve (top) and the other the parental hypovalve (bottom) which results in the bottom being slightly smaller than the parent because a new inside always grows back.



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Continued vegetative reproduction reduces the size until it gets to its smallest size and this diploid cell produces gametes which fuse to form a full size zygote. Only the small cells will undergo sexual reproduction and if they get too small, they can't even do that.



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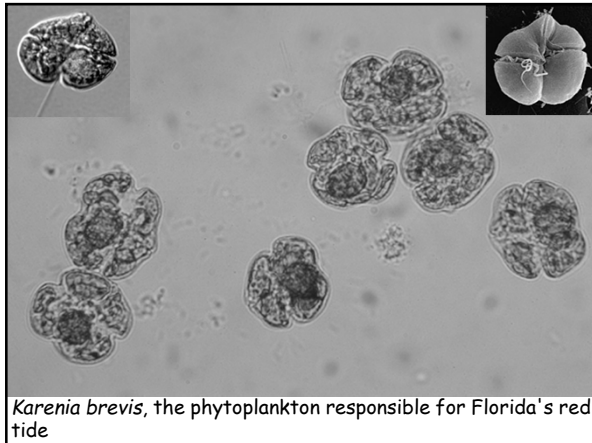
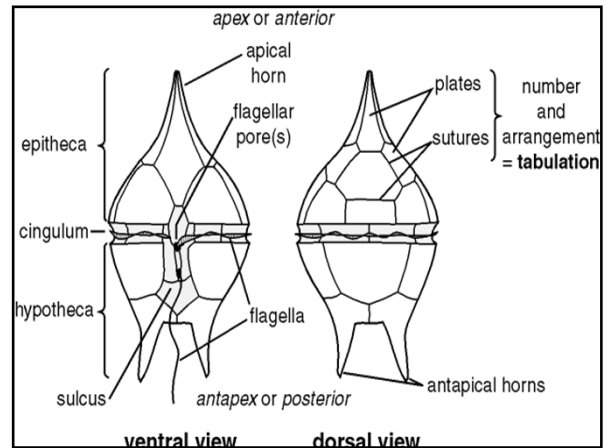
Dinophyta /Pyrrhophyta or the Dinoflagellates Mostly unicellular with 2 unequal flagella , one that wraps around a groove in the middle of the cell, and the other that trails free, and include the non-motile zooxanthellae (found in corals).

The are most abundant in warm waters and second to diatoms in cold water.

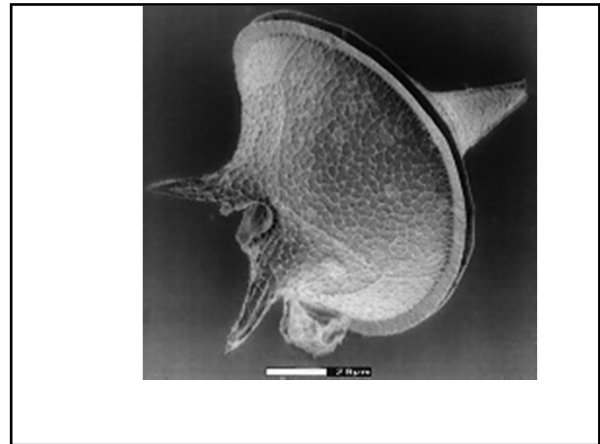
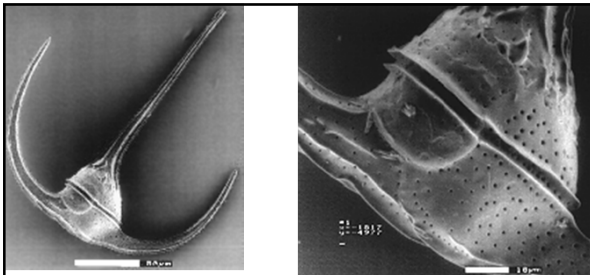
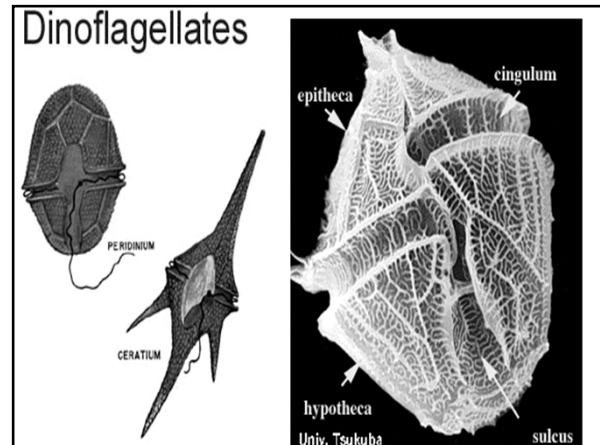
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Characteristics of Dinoflagellates

1. Most are marine
2. Chlorophyll a, c, peridinin. Starch, oils, but can ingest food stuffs
3. Distinctive flagella pattern
4. Some without walls (naked) and others with walls (Armor) with cellulosic plates fitting together like armor which may have spines,



Karenia brevis, the phytoplankton responsible for Florida's red tide

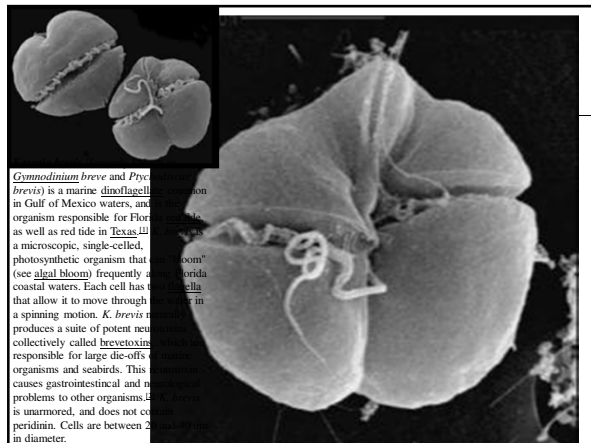


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5. Half are colorless, some heterotrophic, saprophytic, phagocytic, parasitic and some photosynthetic. It is thought that through evolution they have gained the ability to function as primary producers by "capturing" and using chloroplasts from other algae.
6. some bioluminescent

MARINE PLANTS

7. some responsible for red tides and 20 spp. secrete toxins. They reproduce by simple cell division and form blooms that often color the water red, reddish-brown, yellow or unusual shades.

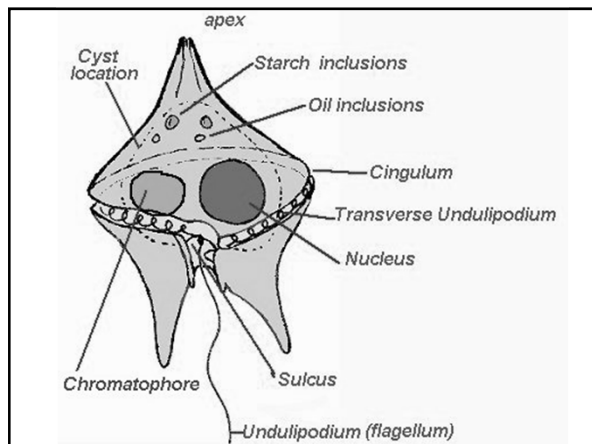


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- a. all toxic ones are photosynthetic
- b. all are estuarine or neritic forms
- c. all probably produce benthic, sexual resting stages
- d. all capable of producing monospecific blooms (suggest competitive advantages through exclusion)

MARINE PLANTS

- e. all produce bioactive-water-soluble or lipid-soluble toxins that are hemolytic, or neurotoxic in activity. (NSP, PSP, DSP)



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The Zooxanthellae are a variety of dinoflagellates which have developed a close association with an animal host. The hosts range from sponges to giant clams but the most important are the ones in the stony corals.

They help fix carbon through photosynthesis, release organic matter to be used by the coral, help in formation of the coral skeleton.

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It was once believed that all zooxanthellae were the same species, *Symbiodinium microadriaticum* (Rowan and Powers, 1991). However, recently, zooxanthellae of various corals have been found to belong to at least 10 different algal taxa.

MARINE PLANTS

THE IMPORTANCE OF CORALLINE ALGAE

Corallines as carbon stores

Coralline algae take up carbon for use in the process of photosynthesis, as do most plants, but they have an additional mechanism of carbon uptake, the calcification process.

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Calcium is deposited in the cell walls of coralline algae in the form of calcium carbonate.

Coralline algae may be one of the largest stores of carbon in the biosphere.



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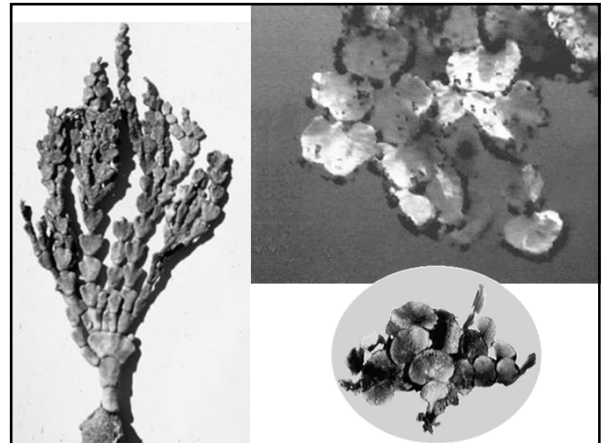
Non-geniculate corallines are of particular significance in the ecology of coral reefs, where they provide calcareous material to the structure of the reef, help cement the reef together, and are important sources of primary production. Coralline algae are especially important in reef construction, as they lay down calcium carbonate as calcite.

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Although they contribute considerable bulk to the calcium carbonate structure of coral reefs, their more important role in most areas of the reef, is in acting as the cement which binds the reef materials together into a solid and sturdy structure.

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An area where corallines are particularly important in constructing reef framework is in the algal ridge that characterizes surf-pounded reefs in both the Atlantic and Indo-Pacific regions. Algal ridges are carbonate frameworks that are constructed mainly by nongeniculate coralline algae (after Adey 1978).



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They require high and persistent wave action to form, so are best developed on the windward reefs in areas where there is little or no seasonal change in wind direction. Algal ridges are one of the main reef structures that prevent oceanic waves from striking adjacent coastlines, and they thus help to prevent coastal erosion.



