

Ministry education and Science of Republic of Kazakhstan
Karaganda State University named after academician Ye.A.
Buketov

Biological and geographical faculty

Botany Department

Course – Botany

Specialty - 5B011300 – «Biology»

Lecture № 12

**Algae. Bacillariophyta, Phaeophyta,
Rhodophyta. Basic parameters of ecology
of algae**

(1 hour)

Lecturer: candidate of biological science, associated professor
Ishmuratova Margarita Yulaevna



Plan of lecture:

- 1 Red algae.
- 2 Diatoms algae .
- 3 Brown algae.

Основная литература:

- 1 Еленевский А.Г., Соловьев М.П., Тихомиров В.Н. Ботаника: систематика высших, или наземных, растений. 2 изд. - М.: Academia, 2001. - 429 с.
- 2 Нестерова С.Г. Лабораторный практикум по систематике растений. - Алматы: Қазақ ун-ті, 2011. - 220 с.
- 3 Родман А.С. Ботаника. – М.: Колос, 2001. - 328 с.

Дополнительная литература:

- 1 Абдрахманов О.А. Систематика низших растений. – Караганда: Изд-во КарГУ, 2009. - 188 с.
- 2 Билич Г.Л., Крыжановский В.А. Биология. Т. 2: Ботаника. - М.: Оникс 21 век, 2002. - 543 с.
- 3 Абдрахманов О.А. Практические работы по систематике низших растений. Ч. 2. Грибы и водоросли. – Караганда: Изд-во КарГУ, 2001. - 144 с.
- 4 Абдрахманов О.А. Лабораторный практикум по бактериям и водорослям. Учебное пособие. - Алматы: Казакадем образование, 2000. - 130 с.

Euglenophyta (euglenoids)

The Euglenophyta or euglenoids are 800 species of unicellular, protozoan-like algae, most of which occur in fresh waters. The euglenoids lack a true cell wall, and are bounded by a proteinaceous cell covering known as a pellicle. Euglenophytes have one to three flagellae for locomotion, and they store carbohydrate reserves as paramylon. The primary photosynthetic pigments of euglenophytes are chlorophylls *a* and *b*, while their accessory pigments are carotenoids and xanthophylls.

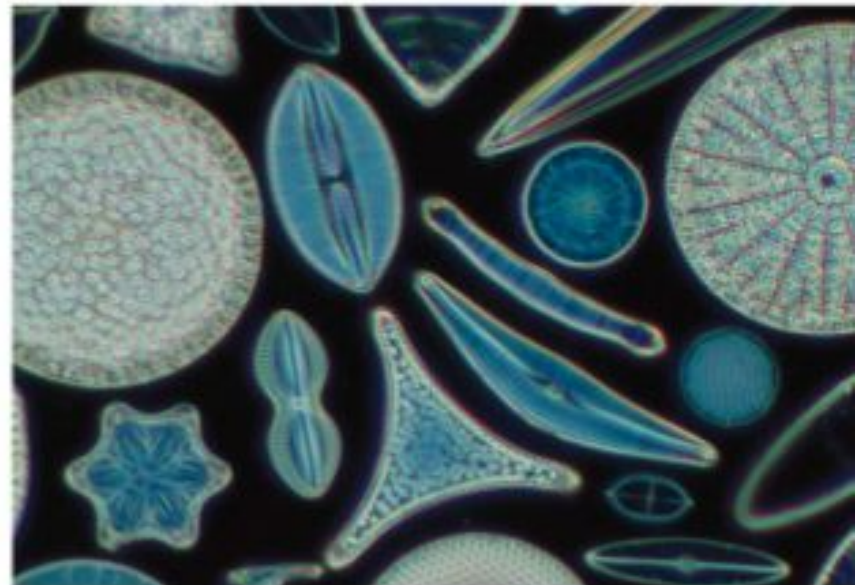
Most euglenoids have chloroplasts, and are photosynthetic. Some species, however, are heterotrophic, and feed on organic material suspended in the water. Even the photosynthetic species, however, are capable of surviving for some time if kept in the dark, as long as they are "fed" with suitable organic materials.

Diatoms

Phylum Bacillariophyta

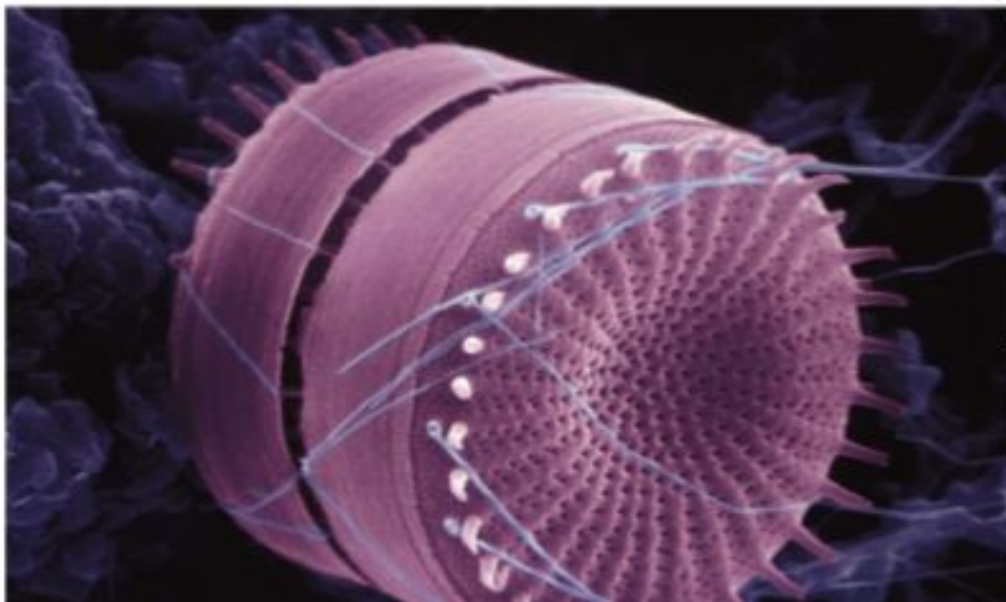
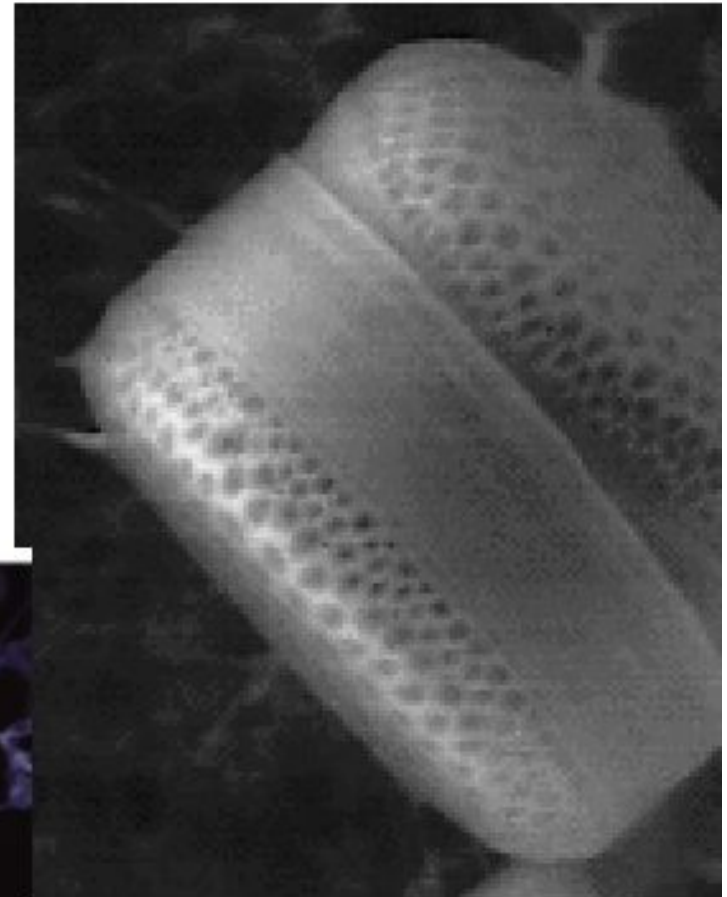
~100,000 species

- Unicellular
- Solitary or colonial
- Typically 20-200 microns in diameter or length
 - Up to 2 millimeters long
- No flagella
- Secrete intricate shell



Diatoms

- Glass-like wall (shell, test)
 - Hydrated silica in organic matrix
 - Asexual reproduction limits



Diatoms

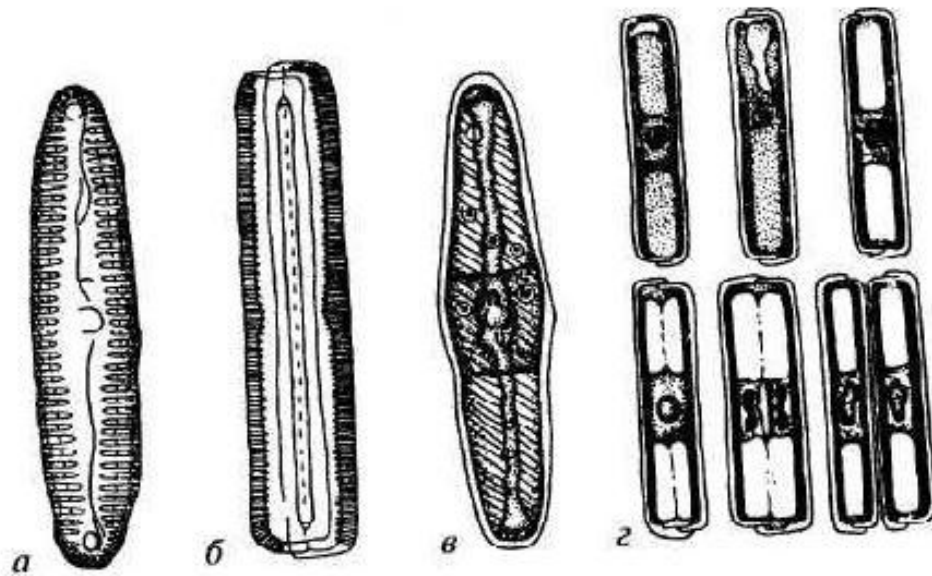
Lifestyle:

- Free floating, can sink or adjust depth
 - Oils, amount of silica accumulated, projections
 - no flagella
- Also grow on whales, turtle shells, aquatic plants, etc
- few terrestrial
- Carbon sink

Diatoms

Resting spores (cysts) - resistant stage

- Metabolically inactive spores
 - Stored photosynthetic products
 - Tough thickened cell walls
- Sink to the bottom of the sea

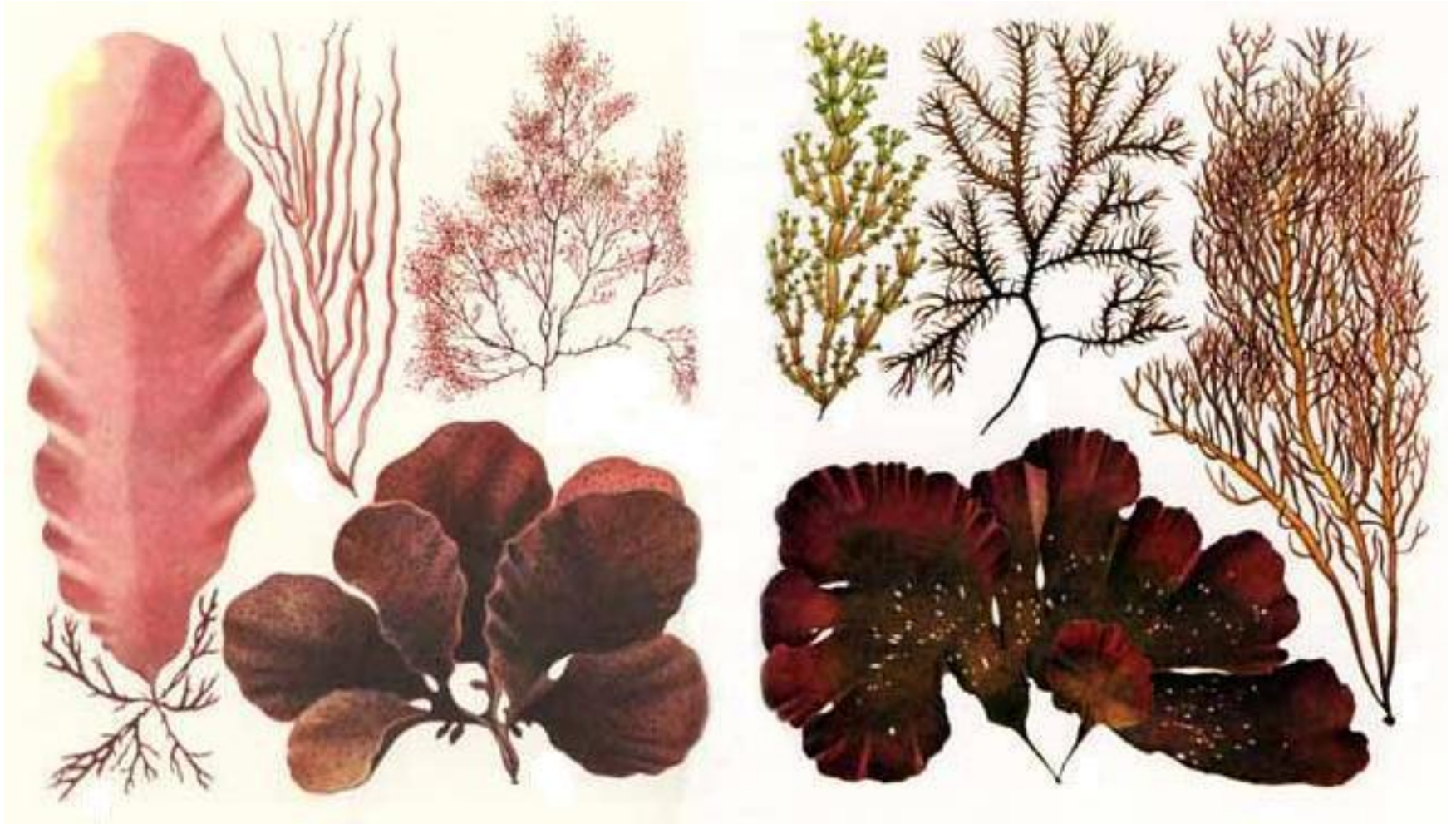


Rhodophyta (red algae)

The Rhodophyta or red algae are 4,000 species of mostly marine algae, which are most diverse in tropical waters. Species of red algae range from microscopic to macroscopic in size. The larger species typically grow attached to a hard substrate, or they occur as epiphytes on other algae. The cell walls of red algae are constructed of cellulose and polysaccharides, such as agar and carrageenin. These algae lack flagellae, and they store energy as a specialized polysaccharide known as floridean starch. The photosynthetic pigments of red algae are chlorophylls *a* and *d*, and their accessory pigments are carotenoids, xanthophyll, and phycobilins.

Some examples of red algae include filamentous species such as *Pleonosporum* spp., so-called coralline algae such as *Porolithon* spp., which become heavily encrusted with calcium carbonate and contribute greatly to the building of tropical reefs, and thalloid species, such as the economically important Irish [moss](#) (*Chondrus crispus*).

Some species of red algae



Red Algae

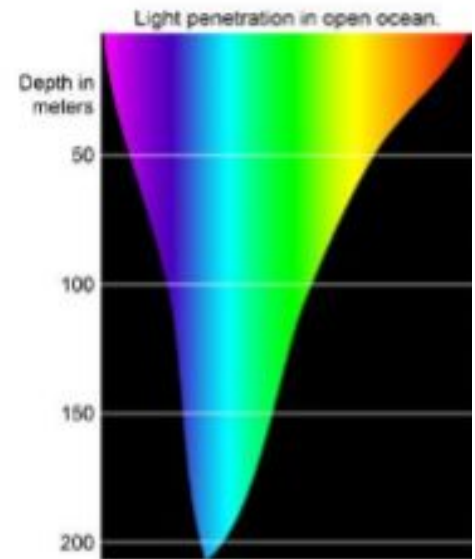
Lifestyle

- Mostly marine
- Abundant in tropical waters
- Present in deep water
 - Color varies by depth

Coralline algae

Reef-building algae

- Calcareous
 - (calcium carbonate cell walls)



Red Algae

Phylum Rhodophyta

~ 6,000 species

- Most multicellular
- Many filamentous
- Key traits
- Accessory pigment phycoerythrin (red carotenoid)
- No flagella

(b) Dulse (*Palmaria palmata*), an edible species with a "leafy" form.



(c) A coralline alga. The cells walls of coralline algae are hardened by calcium carbonate. Some coralline algae are members of the biological communities called coral reefs.



(a) *Bonnemaisonia hamifera*, a filamentous



Porphyra



Polysyphonia



The Paeophyta or brown algae number about 1,500 species, almost all of which occur in marine environments. These seaweeds are especially abundant in cool waters. Species of brown algae are macroscopic in size, including the giant kelps that can routinely achieve lengths of tens of meters. Brown algae have cell walls constructed of cellulose and polysaccharides known as alginic acids. Some brown algae have relatively complex, differentiated tissues, including a holdfast that secures the [organism](#) to its substrate, air bladders to aid with buoyancy, a supporting stalk or stipe, wide blades that provide the major surface for nutrient exchange and [photosynthesis](#), and spore-producing, reproductive tissues. The specialized, reproductive cells of brown algae are shed into the water and are motile, using two flagella to achieve locomotion. The food reserves of these algae are carbohydrate polymers known as laminarin. Their photosynthetic pigments are chlorophylls *a* and *c*, while the accessory pigments are carotenoids and xanthophylls, including fucoxanthin, a brown-colored pigment that gives these algae their characteristic dark color.

Some examples of brown algae include the sargassum weed (*Sargassum* spp.), which dominates the extensive, floating [ecosystem](#) in the mid-Atlantic gyre known as the Sargasso Sea. Most brown seaweeds, however, occur on hard-bottom, coastal substrates, especially in cooler waters.

Some species of brown algae

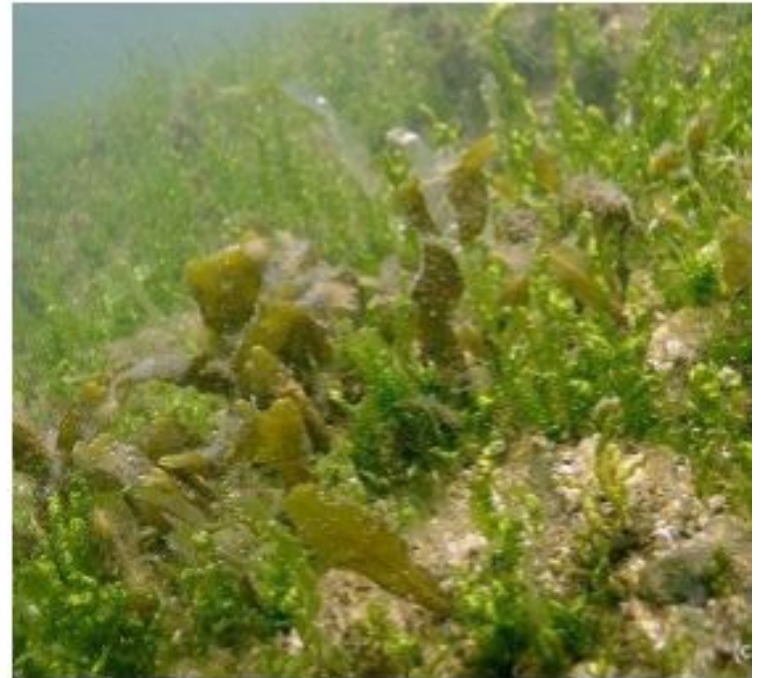


Brown Algae

Many species live in the marine intertidal zone

Cell walls of cellulose and alginic acid

- **Alginic acid** = *gel-forming polysaccharides*
- Protection from waves & dehydration



Brown & green al

Brown Algae

Kelp forests

- Deeper water
- Primarily temperate zone
- Generally not free floating



Control questions:

- 1 Make a characteristics of brown and red algae.
- 2 Which life forms are usual for brown algae?
- 3 Which life forms are usual for red algae?
- 4 Describe the structure of diatoms.
- 5 Which practical uses do red and brown algae have?
- 6 Which pigment are usual for red and brown algae?

Test questions:

Basic pigments of brown algae:

- A) chlorophyll b
- B) chlorophyll d
- C) carotene
- Д) chlorophyll a and c
- E) xantophyll
- F) Fico erythrin

Individual of diatom algae:

- A) ulotrix
- B) diatomae
- C) chara
- Д) volvox
- E) spirogira