

# Benthic algae



# Subtopics



## ☞ Benthic algae

☞ Definition

☞ Importance

☞ Groups

☞ Utilization

# Benthic algae



# Benthic algae



- ❧ Benthic algae usually cover hard bottoms from the seashore down to 20 to 40 m depth, depending on the clarity of the ocean.
- ❧ Macroscopic multicellular marine algae are referred as seaweed and are found at different levels between the tide marks end in sublittoral habitats
- ❧ Below that level, insufficient sunlight hampers their growth. Where the bottom is sandy or muddy the benthic algae cannot attach themselves as they have no roots.

# Benthic algae



- ⌘ In some of these soft bottom areas, where the ocean is calm enough, marine grasses (*Zoostera* sp.) are able to live.
- ⌘ These are not algae but higher plants as most plants on land.
- ⌘ Apart from this, algae dominate the plant life in the ocean.



# Importance of Benthic Algae

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- ∞ Benthic algae are a source of food, energy and cover for many organisms.
- ∞ Dead algae also drift to the open ocean and are a source of food for detritus and filter feeders in ecosystems further away.
- ∞ In this way, the productivity of the benthic algae in shallow waters directly or indirectly affects the efficiency of the entire marine ecosystem

# Importance of Benthic Algae



- ∞ The primary production per  $\text{m}^2$  of the kelp forests is among the highest in the world, comparable to the jungles of the tropics.
- ∞ Therefore, kelp forests are the highest primary production ecosystems in Iceland per  $\text{m}^2$ , on land or water.
- ∞ But as mentioned before, the kelp forests cover a relatively small area compared to the open ocean where the phytoplankton dominates, and therefore their contribution to total primary production is relatively small.

# Importance of Benthic Algae



- ∞ The algae cover is notably (particularly) zoned; different species adapt to different depths or are pushed by competition into marginal zones.
- ∞ In general, physical factors, such as air temperature, salinity or draught (little wind or current), control what species can live in the upper parts of the seashore, but biological factors, such as competition and grazing, control the species composition further down in the ocean.





A few cods in a kelp forest



# SEAWEED BIODIVERSITY

It is estimated that there are ~10,000 species of seaweed occur intercontinental. There are three groups of seaweeds recognized, according to their pigments that captivate light of certain wavelengths and give them their characteristics colours of green, brown and red. Because they need light to survive, seaweeds are found only in the relatively shallow parts of the oceans, which means around the shores.

Marine algae are abundant throughout the ocean and can either float freely or adhere to substrate such as rocks and reefs. The majority of seaweeds are classified as red algae (~6,000 species). There are also brown algae (~2,000 species) and green algae (~8,000 species). None of the algae species are known to be poisonous, and many species are harvested for human consumption.

# Groups of benthic algae



∞ Benthic algae are generally split into three main groups,

1. **Green algae** (chlorophyta),
2. **Brown algae** (phaeophyta) and
3. **Red algae** (rhodophyta),

named after the different colouration caused by different pigments in these groups.

# Groups of benthic algae



## ☞ Rhodophyceae

Grow as single-celled plants or plants that grow as filaments, branched plants, broad flat plates, and messy plants. They come in a variety of sizes, but most red algae are small. All species attach to substrate such as rock or coral and sometimes to an animal shell or even another algae species

**Rhodophyta:** Red algae

Example: *Rhodymenia palmate*



# ☞ Phaeophyceae

- ☞ Contain the largest and most complex algae plants. Pacific kelp are a brown algae species.
- ☞ There are no unicellular or colonial forms of brown algae.
- ☞ This algae are commonly found attached to the substrate in cool, shallow waters, near the shore, in temperate and sub polar regions.
- ☞ Some forms of brown algae have developed adaptations to survive life on the coast where they may be crushed by surf or submerged then exposed with the tide.
- ☞ Large brown algae are used as shelter for some bottom-dwelling animals. They also provide serve as substrate for other algae that grow as epiphytes, or plants that grow on other plants.







## **Phaeophyceae:** Brown Algae

Examples: *Laminaria* and *Saccharina*, *Fucus*,  
*Sargassum muticum*



# Chlorophyceae

- ☞ The most biodiverse of the algae with species that grow in a variety of forms and in a variety of habitats (the Charophyta are found entirely in freshwater for example).
- ☞ They are typically small and simple, with many single-celled species, some that form branched filaments, hollow balls of cells, or broad, flat sheets.
- ☞ Some species attach to sandy shores by secreting a **calcareous cement** rather than **holdfasts** that might shift with the sand and become unstable.

## Chlorophyceae: Green Algae

Examples:

*Chlamydomonas*, *Spirogyra*, *Ulva*.



# Groups of benthic algae



# Groups of benthic algae



# Groups of benthic algae



# SEAWEED BIODIVERSITY

## Red seaweeds

*Rhodymenia palmate*



*Palmaria* sp.



# SEAWEED BIODIVERSITY

## Brown seaweeds

*Laminaria dentigera*



# SEAWEED BIODIVERSITY

## Green seaweeds

*Halimeda cuneata*



*Caulerpa racemosa*





# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Chaetomorpha crassa*

### Classification:

*Empire:* Eukaryota

*Kingdom:* Plantae

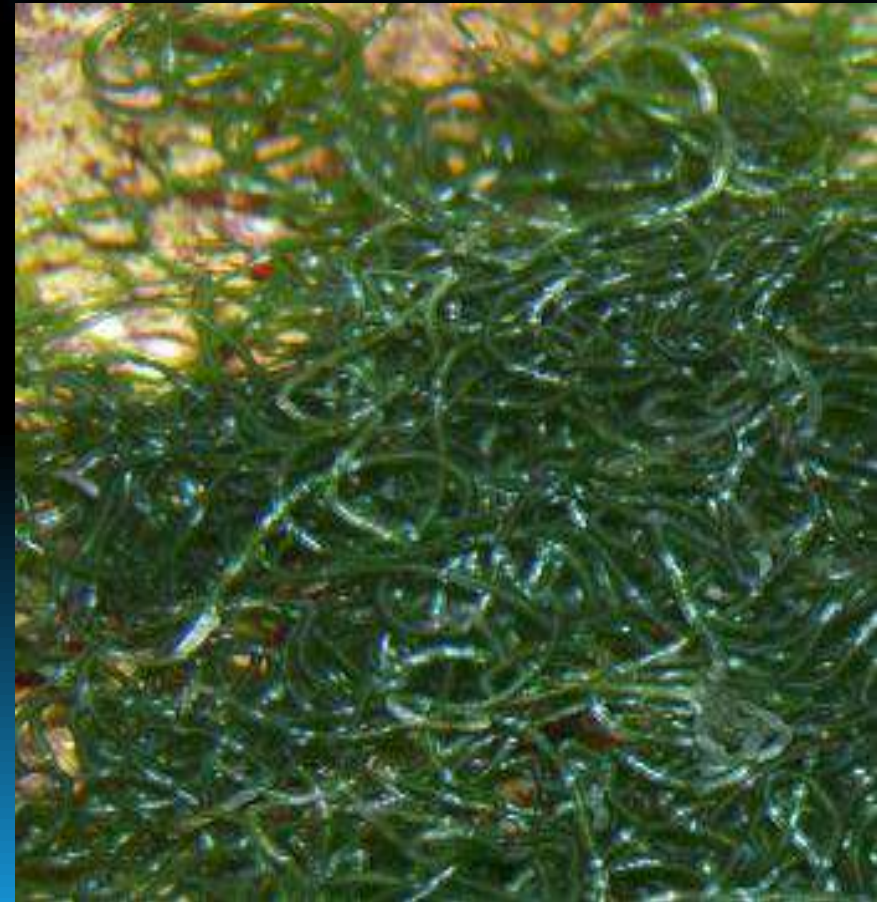
*Phylum:* Chlorophyta

*Class:* Ulvophyceae

*Order:* Cladophorales

*Family:* Cladophoraceae

*Genus:* *Chaetomorpha*



# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Caulerpa racemosa*

### Classification:

***Empire:*** Eukaryota

***Kingdom:*** Plantae

***Phylum:*** Chlorophyta

***Class:*** Ulvophyceae

***Order:*** Bryopsidales

***Family:*** Caulerpaceae

***Genus:*** *Caulerpa*



# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Enteromorpha intestinalis*

### Classification:

***Empire:*** Eukaryota

***Kingdom:*** Plantae

***Phylum:*** Chlorophyta

***Class:*** Ulvophyceae

***Order:*** Ulvales

***Family:*** Ulvaceae

***Genus:*** *Enteromorpha*



# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Ulva lactuca*

### Classification:

Empire: Eukaryota

Kingdom: Plantae

Phylum: Chlorophyta

Class: Ulvophyceae

Order: Ulvales

Family: Ulvaceae

Genus: *Ulva*



# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Gracilaria verrucosa*

### Classification:

*Empire:* Eukaryota

*Kingdom:* Plantae

*Phylum:* Rhodophyta

*Class:* Florideophyceae

*Order:* Gracilariales

*Family:* Gracilariaceae

*Genus:* *Gracilaria*



# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Rhodymenia palmate*

### Classification:

***Empire:*** Eukaryota

***Kingdom:*** Plantae

***Phylum:*** Rhodophyta

***Class:*** Florideophyceae

***Order:*** Rhodymeniales

***Family:*** Rhodymeniaceae

***Genus:*** *Rhodymenia*



# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Laminaria dentigera*

### Classification:

**Empire:** Eukaryota

**Kingdom:** Chromista

**Phylum:** Heterokontophyta

**Class:** Phaeophyceae

**Order:** Laminariales

**Family:** Laminariaceae

**Genus:** *Laminaria*



# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Monostroma fuscum*

### Classification:

***Empire:*** Eukaryota

***Kingdom:*** Plantae

***Phylum:*** Chlorophyta

***Class:*** Ulvophyceae

***Order:*** Ulotrichales

***Family:*** Gomontiaceae

***Genus:*** *Monostroma*





# SELECTED SEAWEED SPECIES WITH IT'S CLASSIFICATION

## *Codium dichotomum*

### Classification:

***Empire:*** Eukaryota

***Kingdom:*** Plantae

***Phylum:*** Chlorophyta

***Class:*** Ulvophyceae

***Order:*** Bryopsidales

***Family:*** Codiaceae

***Genus:*** *Codium*



# Utilization of benthic algae



- used as sheep food, fertilizers and for burning in stoves.
- actually very bad for that, but general lack of other things to burn forced many Icelanders to use kelp for that purpose.
- Some species are also edible and provided an important food source in some areas.
- Benthic algae are rarely eaten today, except as rare exotic food and with sushi that has recently become popular.



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