Plankton
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Introduction
Plankton

- Definition: Organisms in the water that are not able to swim against the current
- largest ecosystem of the world
- only 30,000 (estimated) metazoan species
- low diversity compared to terrestrial ecosystems
## Kinds of plankton by size

<table>
<thead>
<tr>
<th>Kind</th>
<th>Size</th>
<th>Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femtoplankton</td>
<td>&lt; 0.2 µm</td>
<td>virus, phage</td>
</tr>
<tr>
<td>Picoplankton</td>
<td>0.2 – 2 µm</td>
<td>bacteria, smallest phytoplankters</td>
</tr>
<tr>
<td>Nanoplankton</td>
<td>2 – 20 µm</td>
<td>phytoplankter, protozoans</td>
</tr>
<tr>
<td>Mikroplankton</td>
<td>20 – 200 µm</td>
<td>phytoplankter, protozoans</td>
</tr>
<tr>
<td>Mesoplankton</td>
<td>200 – 2000 µm</td>
<td>biggest protozoans, colony-forming phytoplankters, zooplankters (copepods)</td>
</tr>
<tr>
<td>Makroplankton</td>
<td>2mm – 2cm</td>
<td>big zooplankters</td>
</tr>
<tr>
<td>Megaplankton</td>
<td>&gt; 2cm</td>
<td>biggest zooplankters</td>
</tr>
</tbody>
</table>
Trophic relations

Producers
- phytoplankton
- photosynthesis
- primary producers

Consumers
- zooplankton
- no photosynthesis
- primary consumers
  - herbivorous zooplankton
- secondary or tertiary consumers
  - carnivorous zooplankton

Decomposers
- bacteria and fungi
Phytoplankton

- photoautotrophic
- can only live in the photic zone
- abundance determined by amount of chlorophyll in the water
- diatoms and dinoflagellates (microplankton)
- base of the marine food web (may reach 50,000 cells per liter)
- bloom under special conditions → extremely large numbers
Phytoplankton

- **diatoms**
  - largest group of primary producers
  - 900 species in the mediterranean
  - unicellular, form colonies

- **dinoflagellata**
  - second largest group of primary producers
  - unicellular and flagellated

*Chaetocerus decipiens*

*Ceratium sp.*
Zooplankton

- generally heterotrophic (feed on phytoplankton)
  - most species live in the photic zone
  - concentration of plankton in the upper 200m

- diel vertical migration
  - move up when sunlight appears and sink down upon sunset

- crustacean plankton dominates the zooplankton
  - (e.g. copepods, decapods, …)
Kinds of zooplankton
Gelatinous plankton

- e.g. cnidarians, some gastropods, polychaetes, tunicates, fish eggs and larvae,…

- bodies with an extremely high water and salt content

- part of the so called „marine snow“
Cnidaria

- free-swimming medusae
- arises from polyp through budding
- medusae reproduce sexually
  → fertilized eggs develop into free-swimming planulae

Aurelia sp.
Meroplankton

- pelagic larvae of marine invertebrates
- stay in plankton for weeks or months
- may dominate the plankton community depending on the season

- e.g. american oyster
  - broadcasts 15 – 115 million eggs

- high mortality
  - most signifikant factor: predation
  - predators: e.g. scypho- and hydromedusae, shrimps,...
Meroplankton

- **Teleostei**
  - marine teleosts produce up to some hundred millions of eggs
  - egg diameter mostly between 0.7 and 1.5mm

- **Tunicates**
  - swimming larvae length between 0.6 and 4.5mm.
Polychaeta

- belong to annelida
- 9,000 species in the marine environment
- as larvae and mature males and females

Tomopteris sp.
Copepods

- crustaceans
  - taxon with highest species diversity
- belong to mesoplankton
- dominate the zooplankton
- free-living and parasitic species

*Calanus sp.*
The importance of plankton
Euphausia superba

Megaptera novaeangliae

- one humpback whale can eat up to 2 tons of krill in 24h
- feed on krill for one month
Marine snow

- organic aggregates
  - gelatinous plankton (e.g. cnidarians, polychates, ...)
  - zooplankton fecal pellets
  - zoo- and phytoplankton skeletons
  - zooplankton exuvia

- forms the sea floor of the abyssal plains
Marine snow

is also known as marine snow.

https://www.youtube.com/watch?v=a0n3U2pWITI
Global warming

- Temperature is the most important exogenous factor on species distribution.

- Effect on species compositions in certain areas:
  - neozoans
  - e.g. *Mnemiopsis leidyi* (invaded Black Sea and Caspian Sea)
    - no enemies
    - rapid population increase
    - drastic consequences for fish populations
Marine phosphorescence

- bioluminescence

- among others by dinoflagellates (e.g. *Noctiluca scintillans*)

- light signal upon touch

- not always dependent on concentration of biolumincent organisms

*Noctiluca scintillans*
Marine phosphorescence

https://www.youtube.com/watch?v=KzJNOPA3-K8
Picture citations

5. https://www.flickr.com/photos/55038698@N03/5184620115/
Citations - videos

- https://www.youtube.com/watch?v=a0n3U2pWITI
- https://www.youtube.com/watch?v=KzJNOPA3-K8
- https://www.youtube.com/watch?v=r8rSC9mX328
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Citations

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- Marinbiologische Exkursion Calvi Korsika 2014 - Bericht