INTRODUCTION

1828 John V. Thompson operated a tow net and described the zoea larva of the crab
1833 he described the life history of the barnacle (planktonic larvae of sessile organism).
He further demonstrated the existence of the larvae of many sedentary animals in the plankton.
First mention in literature of plankton tow, or “towing” net

BRIEF HISTORY AND ECOLOGICAL IMPORTANCE

1780’s observations under the first microscopes on small animals in droplets of water

Presence of plankton in the water was suspected and presence was only confirmed about 175 years ago.

Leeuwenhoek’s microscopes & original 16th century samples viewed under his original single lens microscope.

Barnacle Life-cycle

Zoea larva of the crab
Barnacle nauplius larva

New Baby Barnacles (recruits)
Crab Life Cycle

The plankton net became more popular when Johannes Muller of Berlin collected plankton by towing a fine-meshed plankton net for the first time in 1845. This generated a lot of plankton studies and were appreciated fully only during the **Challenger Expedition of 1873-6**. With this, it was realized the variety and extent of plankton distribution in the oceans.

Victor Hensen made the first serious attempt to quantify the study of plankton. Zooplankton was the intermediate step in the food chain through which fish populations were able to feed from the prime producers, the phytoplankton.

Therefore, if one knew the size of the plankton population, then the size of the fish population would follow.

**Fig. 3.2** Changing concepts of aquatic microbial food webs through time.

(a) In the mid-1960s through the early 1970s prevailing views of food webs were relatively simple, involving linear transfer of food energy from algal producers to consumers (zooplankton) to secondary consumers (fish).
Hensen defined plankton in 1886 and the term was refined by Haeckel in 1890 and other related terms were established.

By 1900, researchers have recognized the importance of plankton.

INTRODUCTION

DEFINITIONS

Planktonology - the study of plankton

The term plankton was originally coined by Hensen in 1886 but was rather ill-defined. This was redefined by Haeckel in 1890 and gave it its present day meaning.

Plankton - taken from the Greek verb, planktos, meaning “wandering” or “roaming”

- defined “as organisms that live in the water column whose powers of locomotion are such that they are incapable of making their way against the current and are thus passively transported by currents in the sea”

- although some of them have locomotory organs such as cilia and flagella or are able to swim, their movements in the water column are nearly completely controlled by water turbulence and currents and by the bulk density of the organisms.
movement by these locomotory organs or by swimming serve chiefly
- to keep them afloat
- alter their level
- obtain food
- avoid capture
- find a mate or
- set up water currents for respiration.

CLASSIFICATION OF PLANKTON

1. Biological Classification

1.1 Component Organisms

**Phytoplankton** - plant plankton
- photosynthetic planktonic protists and plants
- usually consists of single-celled organisms or of chains of cells
- solitary or colonial

**Zooplankton** - animal plankton
- non-photosynthetic planktonic protists or animals
- ranging from single-celled forms to smaller vertebrates such as larval fishes

Other terms used

**Mixoplankton** - plankton that do not fit either the phytoplankton or zooplankton
- some protists may be photosynthetic, but can also ingest other plankton

**Virioplankton** - planktonic virus

**Bacterioplankton** - planktonic bacteria

**Mycoplankton** - planktonic fungi

**Protozooplankton** - planktonic protozoans (unicellular)
**Metazooplankton** - planktonic metazoans (multicellular)

1.2 Length of Planktonic Life

**Meroplankton** - plankton that spend only part of their lifetime in the plankton
- Transitory or temporary plankton
- planktonic spores, eggs or larvae of free-swimming (nekton) or bottom-living (benthic) organisms; usually early life stages
- for sessile species, the planktonic larval stages provide an essential means of dispersal.

**Holoplankton** - plankton that spend all their lifetime in the plankton
- permanent plankton (= euplankton)

**Tychoplankton** (pseudoplankton) - accidental plankton – "organisms caught up in water currents or washed into the habitat"
1.3 Habitat Categories

**Neritic plankton** - plankton occurring in coastal waters
- waters overlying continental shelves

**Oceanic plankton** - plankton occurring in the open sea
- waters beyond continental shelves

**Epiplankton** - plankton of the epipelagic zone, i.e. within the uppermost 300m during daytime

**Bathyplankton** - plankton of deep levels

**Hypoplankton** - plankton living near the bottom

**Neuston** - plankton occurring on the water surface (water-air interface) such as bacterial films - uppermost few to tens of millimeters of the surface layer

**Epineuston** - plankton on the aerial side

**Hyponeuston** - plankton on the aquatic side

**Pleuston** - plankton that live at the surface but protrude into the air and are moved mainly by wind rather than by current; includes animals with floats (ex. Portuguese man-of-war)
2.0 Size Classification

Plankton can also be classified according to size ranges. There are, unfortunately, no agreed limits to these dimensions.

A size range should always be quoted when the terms referring to size are used.
- artificial classification
- meaningful when food web in the planktonic community is investigated

---

### Grouping on Plankton by Size based on Classification by Dussart (1965) and Proposed by Omori and Ikeda (1984)

<table>
<thead>
<tr>
<th>Group</th>
<th>Size Limits</th>
<th>Major Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water bottle plankton</td>
<td>&lt; 2 μm</td>
<td>Free bacteria</td>
</tr>
<tr>
<td>1. Ultranano plankton</td>
<td></td>
<td>Most phytoplankton species, foraminiferans, ciliates, rotifers, copepod nauplii</td>
</tr>
<tr>
<td>2. Nanoplankton</td>
<td>2-20 μm</td>
<td>Fungi, small flagellates, small diatoms</td>
</tr>
<tr>
<td>3. Microplankton</td>
<td>20-200 μm</td>
<td>Cladocerans, copepods, larvacens</td>
</tr>
<tr>
<td>Net plankton</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mesoplankton</td>
<td>200 μm – 2 mm</td>
<td>Pteropods, copepods, euphausiids, chaetognaths</td>
</tr>
<tr>
<td>5. Macroplankton</td>
<td>2-20 mm</td>
<td></td>
</tr>
<tr>
<td>6. Mikronekton</td>
<td>20-200 mm</td>
<td>Cephalopods, euphausiids, segestids, myctophids (organisms with backbones or exoskeletons)</td>
</tr>
<tr>
<td>Generally fragile and difficult to capture with nets without damage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Megaplankton</td>
<td>&gt;200 mm</td>
<td>Scyphozaans, thaliaceans (gelatinous plankton)</td>
</tr>
</tbody>
</table>

1 micron (μm) = 0.001 mm (10⁻³ mm) = 10⁻⁶ m
1 mm = 1000 μm = 0.001 m
1 cm = 10 mm
1m = 100 cm

*Other categories: (Lalli & Parsons, 1997)
- Picoplankton – 0.2-2.0 μm (bacteria)
- Femtoplankton – 0.02 – 0.2 μm (viruses)
Assignment for Monday & Thursday (9 & 12/1/2011)

1. Access e-kuliah for MMB 3302 (Planktonology), access the “Documents” folder and “Assignment 9 Jan 2011” sub-folder.

2. Read and do Learning Activity 1.


4. Discussion of the above will be done on Sunday & Wednesday, January 9 & 12, 2011.