

# **Marine Planktology**

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# STAFF



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Journal Plankton Research, Journal Marine  
Biological Association, Marine Biology

# INTRODUCTION

1. **Definition**
2. **The Relation Between Marine Planktology and Other Disciplines of Oceanography**
3. **Ecological Groups of Plankton**
4. **Economic Importance**
5. **Brief History and Prospects**

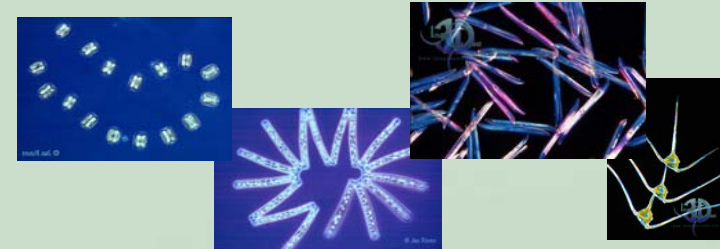


# 1 Definition

- **Plankton (planktos, Victor Hensen, 1887): drifters of the open ocean**

Nekton = free swimmers of the sea

Benthos = dwellers of the sea floor



- **Planktology: the science of studying the life and activities of plankton**



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## 2 Relationship

- **Planktology:** morphology, taxonomy, ecology, physiology, biochemistry

Marine Biology

Biological Oceanography

- **Relation between Marine Planktology and Other Disciplines**

Biology

Oceanography

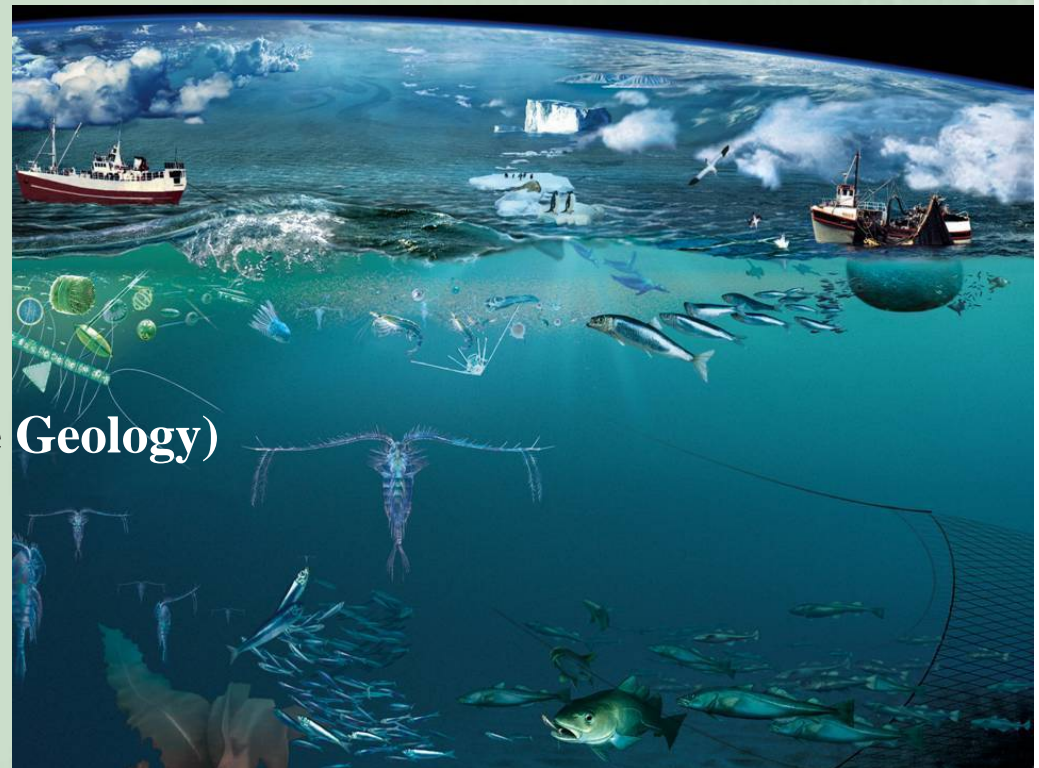
Aquaculture

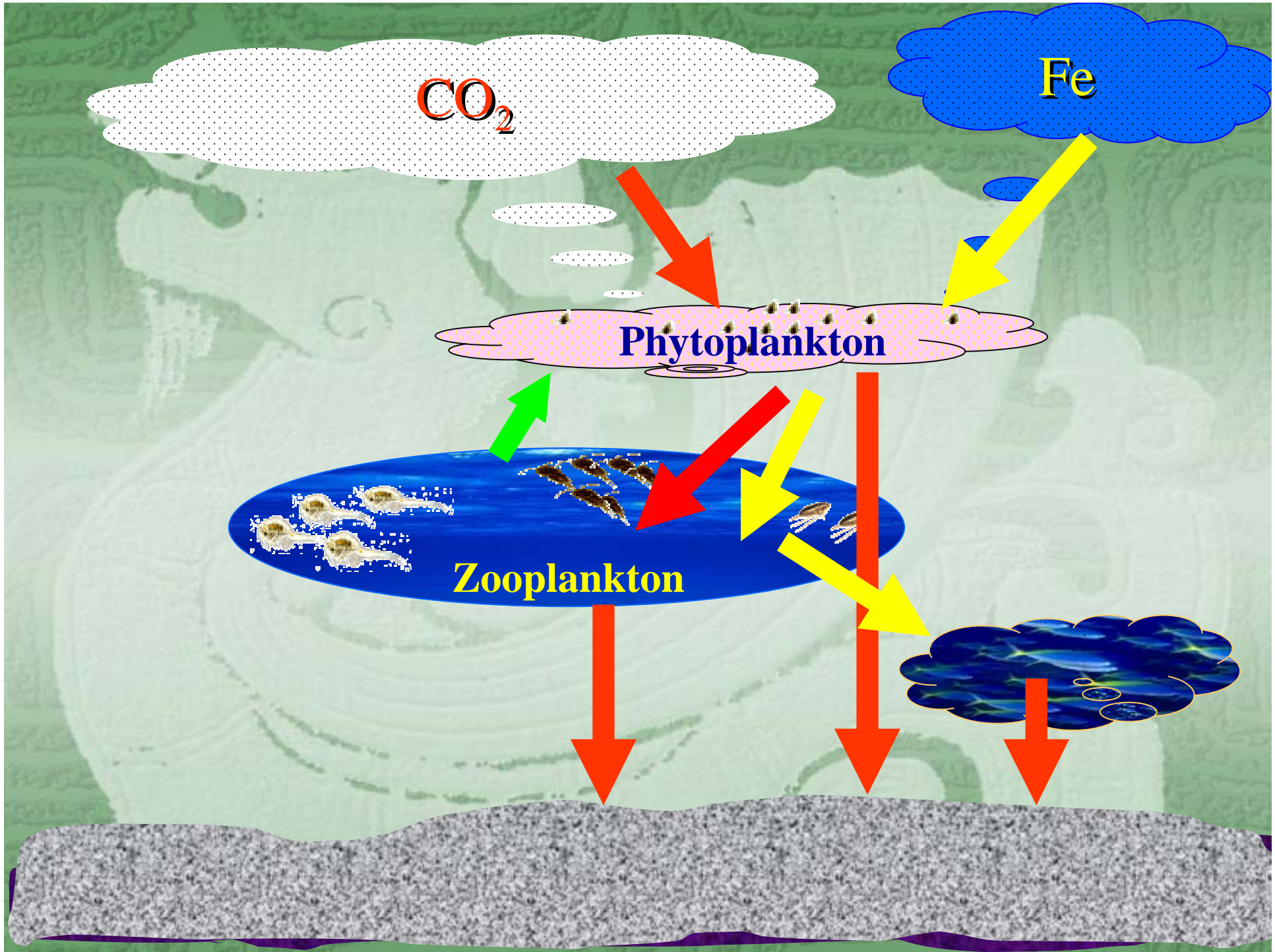
Fishery

Meteorology

Marine Sedimentology (Marine Geology)

Environmental Science







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## 3 Ecological Groups

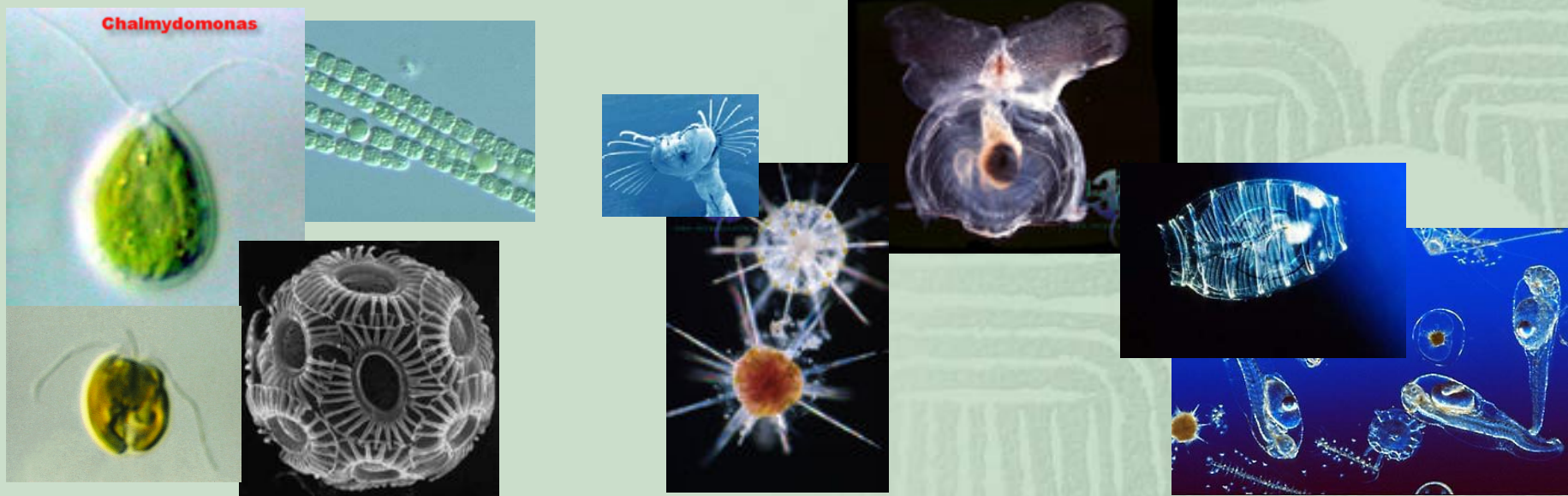
### 3.1 Type of Nutrition

#### Phytoplankton: autotrophic

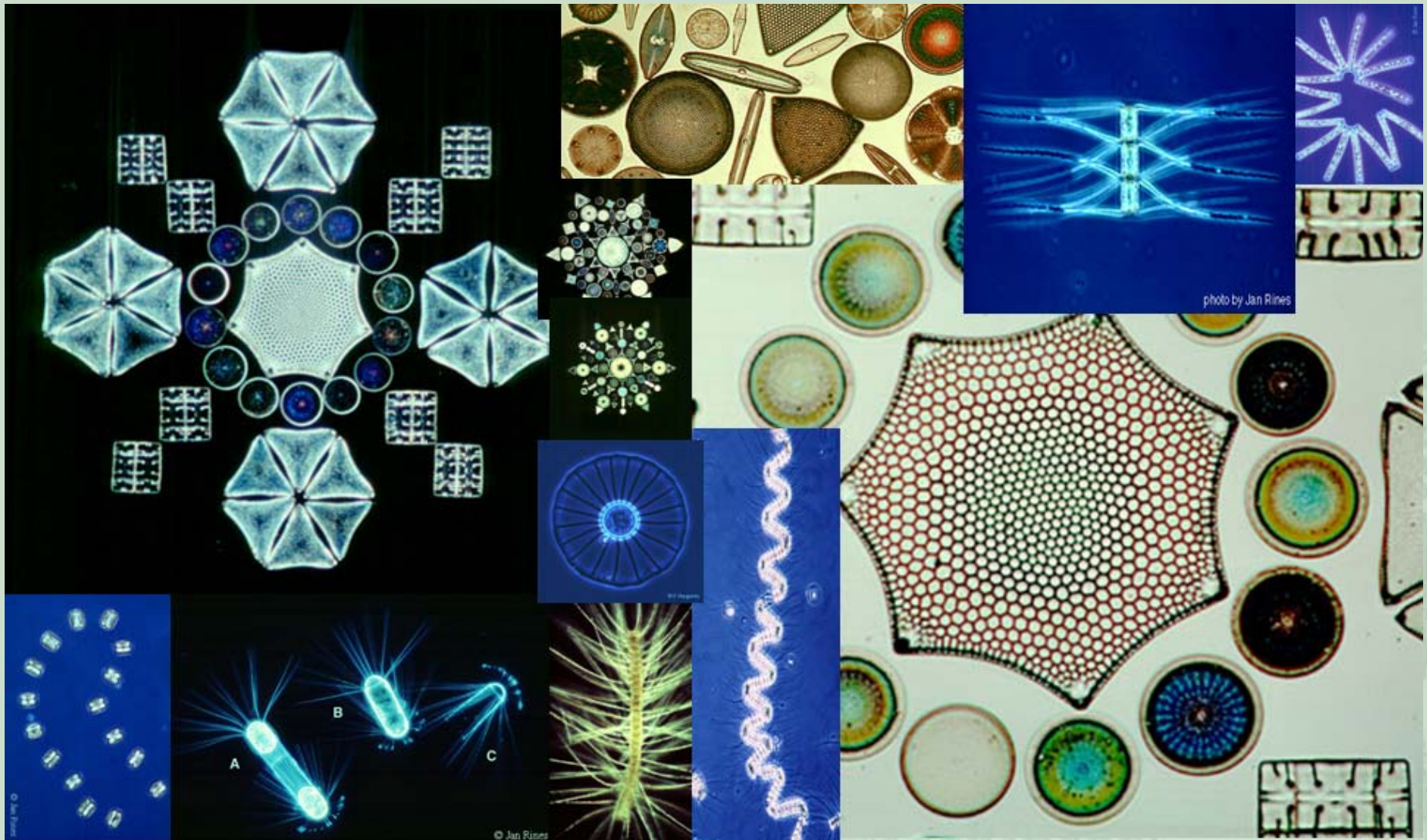
bacteria and unicellular algae (Bacillariophyta, Pyrrophyta, Chlorophyta, Cyanophyta, Chrysophyta, Xanthophyta, Cryptophyta and Euglenophyta)

#### Zooplankton: heterotrophic

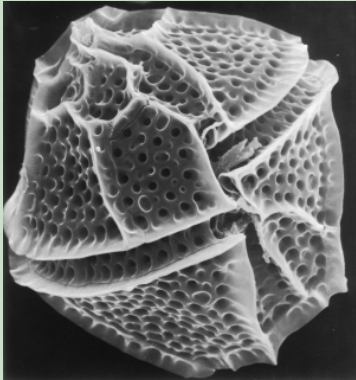
Protozoa, medusae, Rotifera, Crustacea, Chaetognatha, pelagic Mollusca, Tunicata, larvae of invertebrate and lower chordates



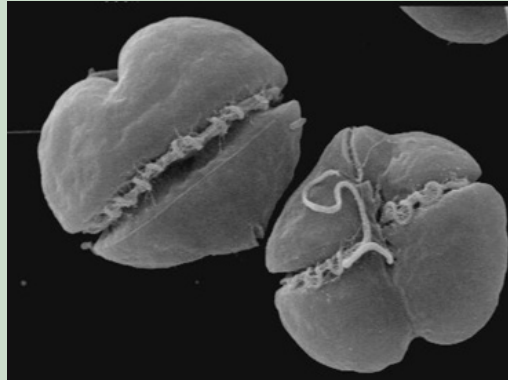
# Phytoplankton 1: Diatom



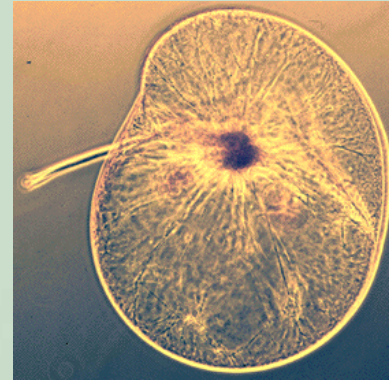
# Phytoplankton 2: Dinoflagellates



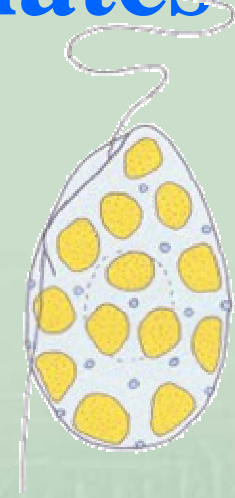
*Gonyaulax polyedra*



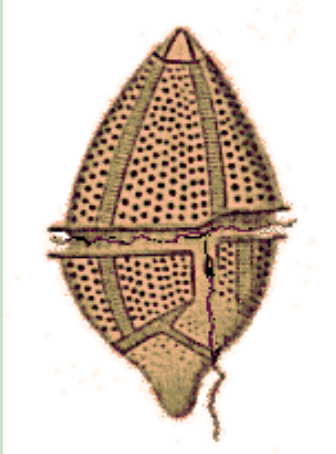
*Gymnodinium breve*



*Noctiluca sp*



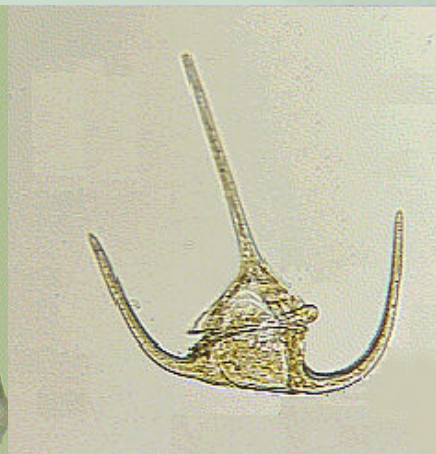
*Olisthodiscus*



*Peridinium sp*



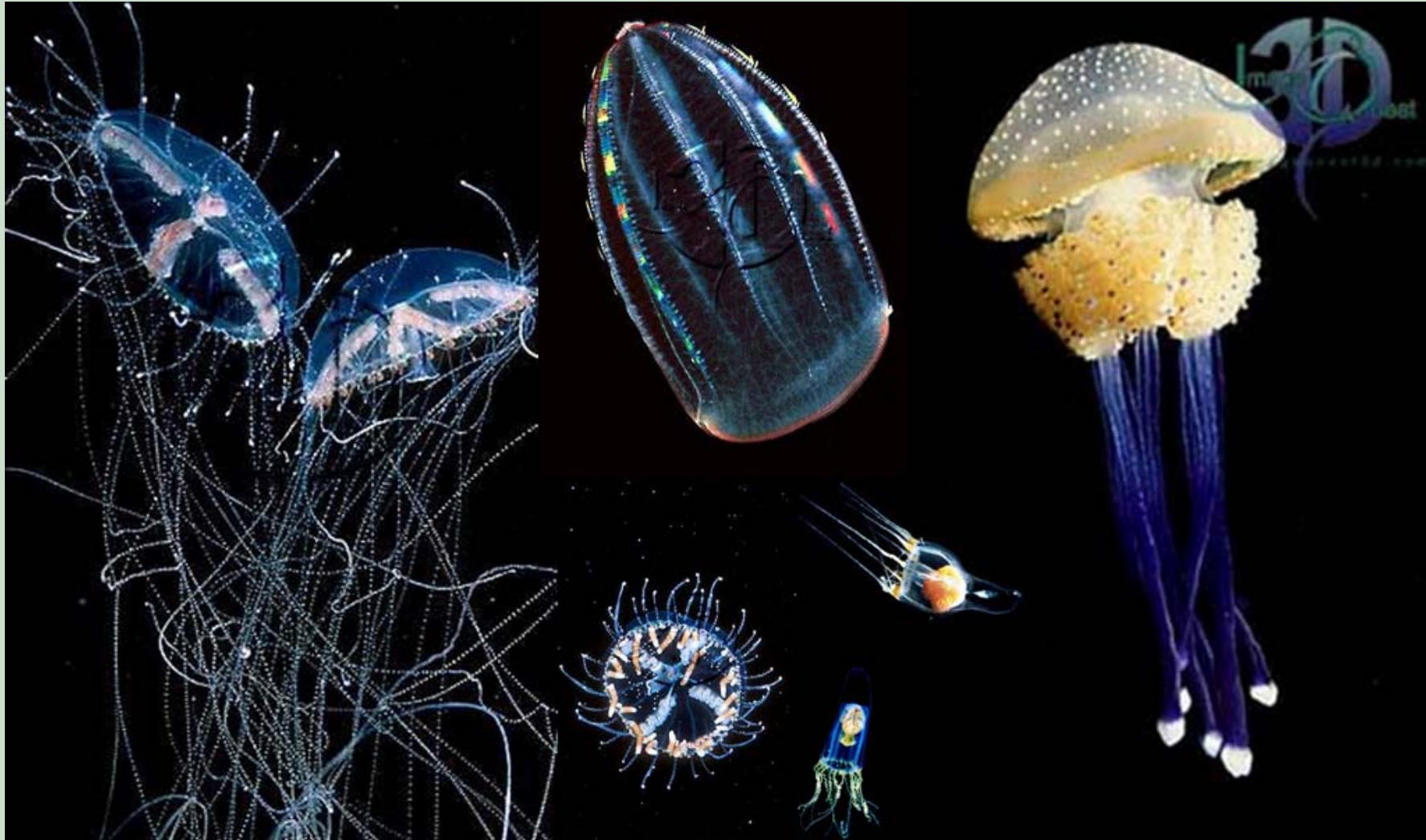
*Prorocentrum micans*



*Ceratium tripos*



# Zooplankton 1: Medusa





## 3 Ecological Groups

### 3.2 Body Size

Tab. Body-size and representatives of different groups

Group	Body-size	Representatives
<b>Femtoplankton</b>	0.02 ~ 0.2 $\mu\text{m}$	Viruses, Bacteria
<b>Picoplankton</b>	0.2~ 2 $\mu\text{m}$	Bacteria, Chrysophyta
<b>Nanoplankton</b>	2 ~ 20 $\mu\text{m}$	Diatom, Pyrrophyta, Chrysophyta, Chlorophyta, Xanthophyta
<b>Microplankton</b>	20 $\mu\text{m}$ ~ 1 mm	Diatom, Cyanophyta, Protozoa, Crustacea, Rotifera, larvae
<b>Mesoplankton</b>	1 ~ 5 mm	Medusae, Copepoda, Cladocera, Ostrapoda, Chaetognatha, Pteropoda, Heteropoda, Tunicata
<b>Macroplankton</b>	5 ~ 10 mm	Medusae, Copepoda, Euphausiacea, Hyperiididae, Sergestinae, Chaetognatha, Pteropoda, Heteropoda, Tunicata
<b>Megaplankton</b>	> 1 cm	Medusae, Crustacea, Tunicata

## 3 Ecological Groups

### 3.3 Duration of Planktonic Stage of Life Cycle

- **Holoplankton:**  
The entire life is spent drifting about in water
- **Meroplankton:**  
Only a part of life (usually during larval stage) is spent as plankton.
- **Tychoplankton:**  
This group of organisms leads only a temporary planktonic life.





### 3.4 Horizontal and Vertical Distribution and Mode of Life

- Horizontal distribution

#### Neritic plankton

Plankton inhabit coastal **low-salinity** water, sometimes invade the estuary

#### Oceanic plankton

A group of stenohaline plankton inhabit **high-salinity** offshore water

- Vertical distribution

#### Epiplankton

inhabit the **upper layer** (0-10m), including a special group living in the surface layer (0-5cm) **neuston** (**pleuston**, **neuston proper**)

#### Mesoplankton

inhabit the **middle layer** (100-400m)

#### Hypoplankton

inhabit the **lower layer** (>400m), including bathyplankton in the deeper layer (>600m)



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## 4 Economic Importance

- **Beneficial**

  - Food of many economic animals

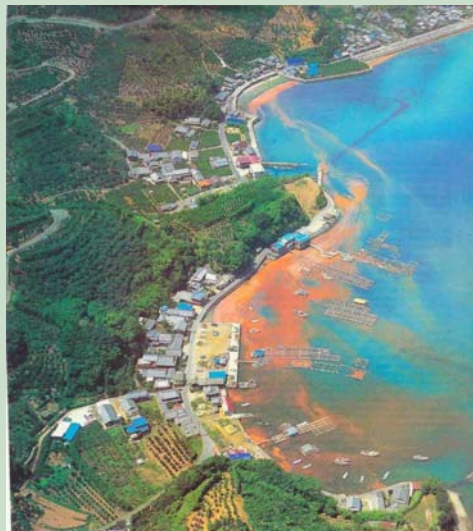
  - Indicator of currents, oil, pollutants

  - Plankton Fishery

- **Detrimental**

  - Red tide

  - Predator and Parasite of Aquaculture



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## 5.1 Begins (1880's-1930's)

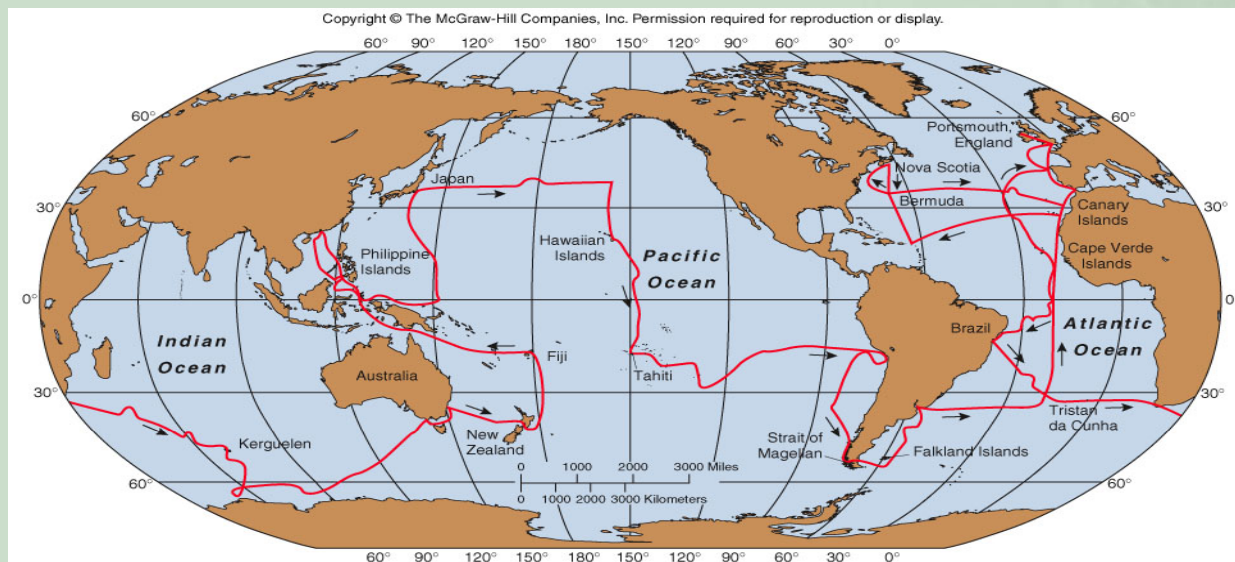
### Taxonomy and Morphology

- **British Challenger Expedition (1872-1876)**  
*first world view*

*Challenger Reports 50 vols, 4700 new species*

- **German Plankton Expedition (1889)**

*Ergebnisse der Plankton Expedition*



**Track of HMS Challenger 1872 - 1876**

### 5.2 Expands (1930's-1980's)

#### Experimental Research

- Marshall S. M., A. P. Orr, 1955. **The Biology of a Marine Copepod *Calanus finmarchicus***
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# 5 History & Prospects

## 5.3 Booms (1980's- )

### Application New Technologies

- **Biodiversity**

  - Census of Marine Life CoML (2004)

  - Molecular Biology

- **Global Productivity**

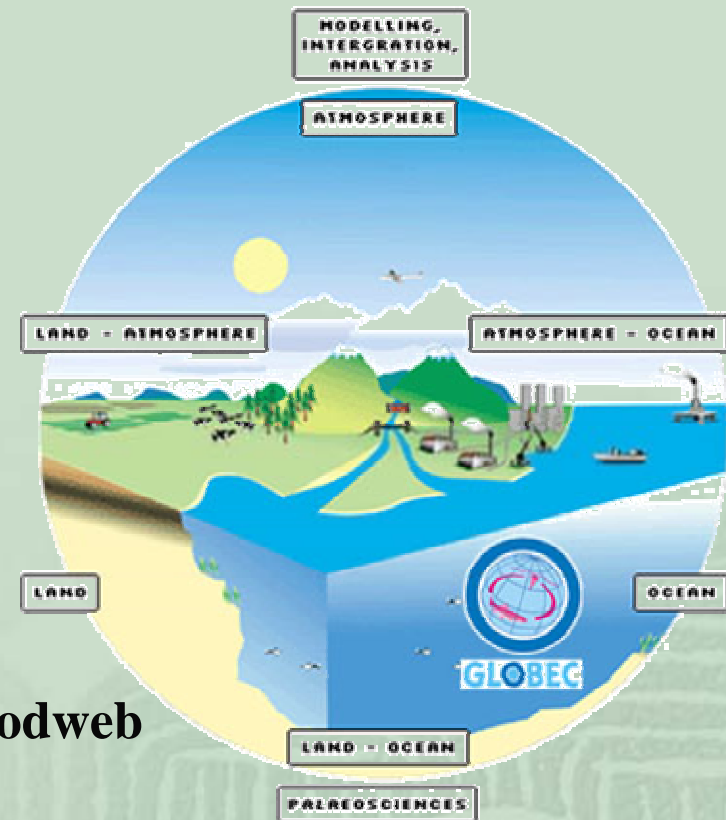
  - New and Regenerated Productivity

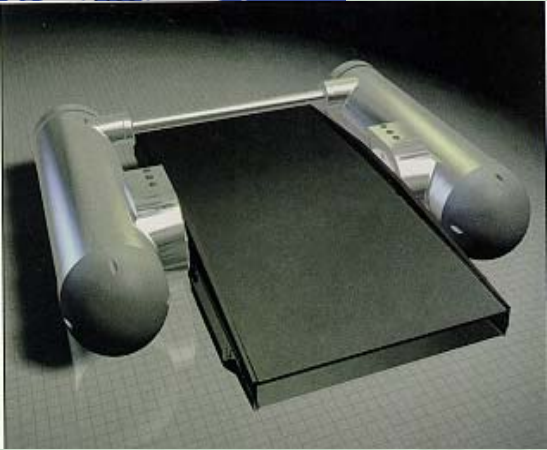
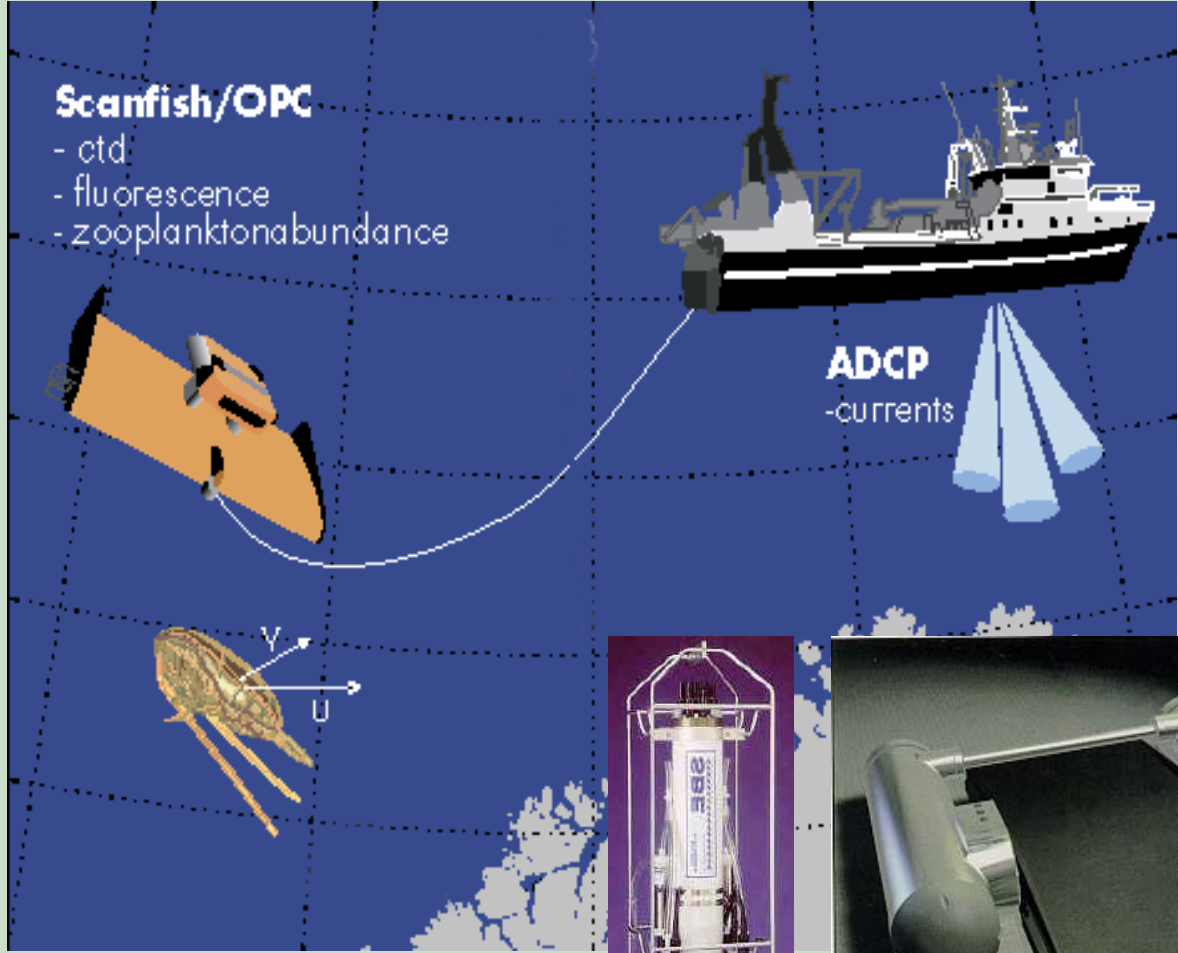
  - Microbial Character of the Pelagic Foodweb

  - Zooplankton Swim, Feed and Breed

- **Plankton and Global Climate Changes**

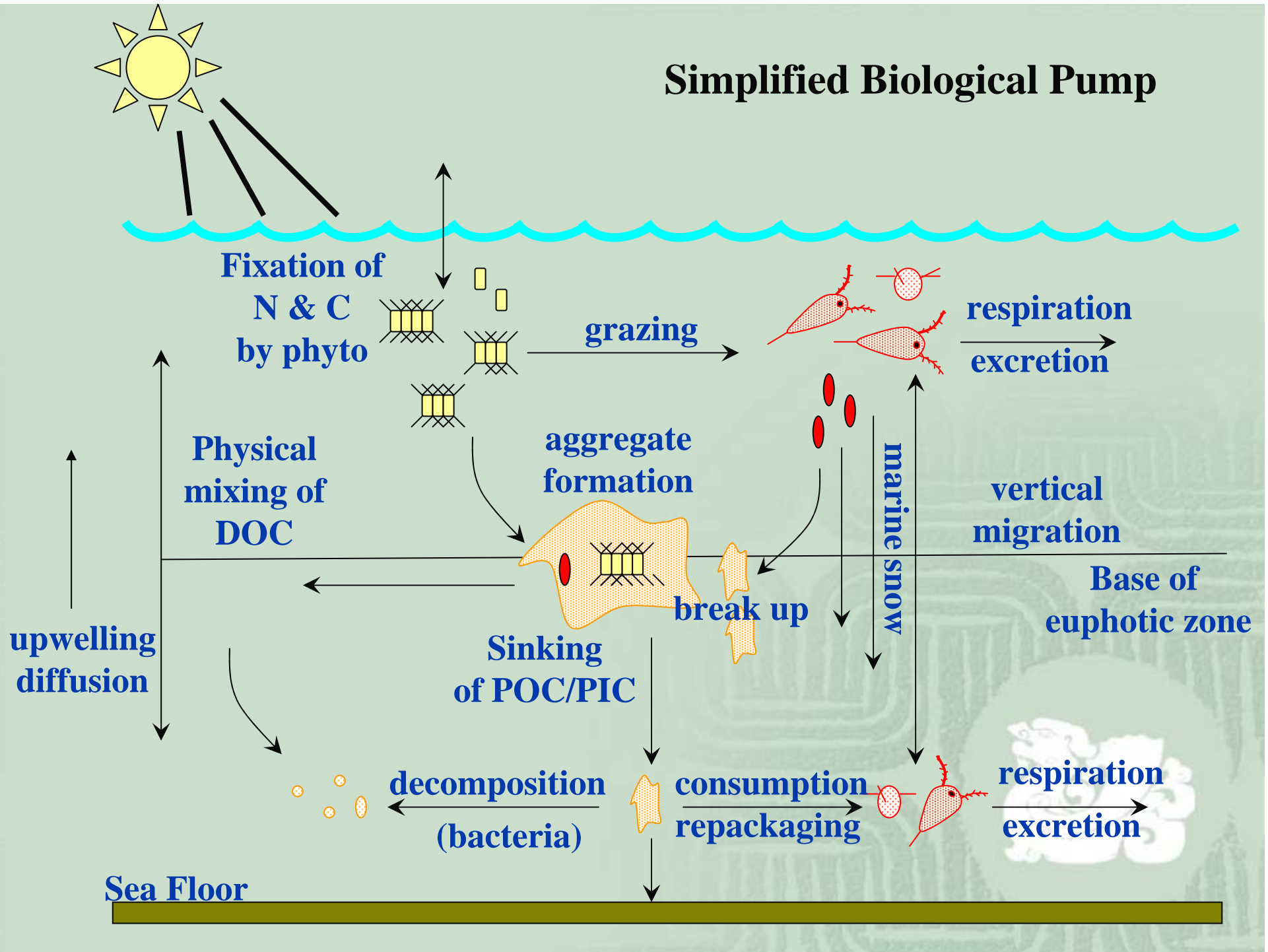
- **Model**



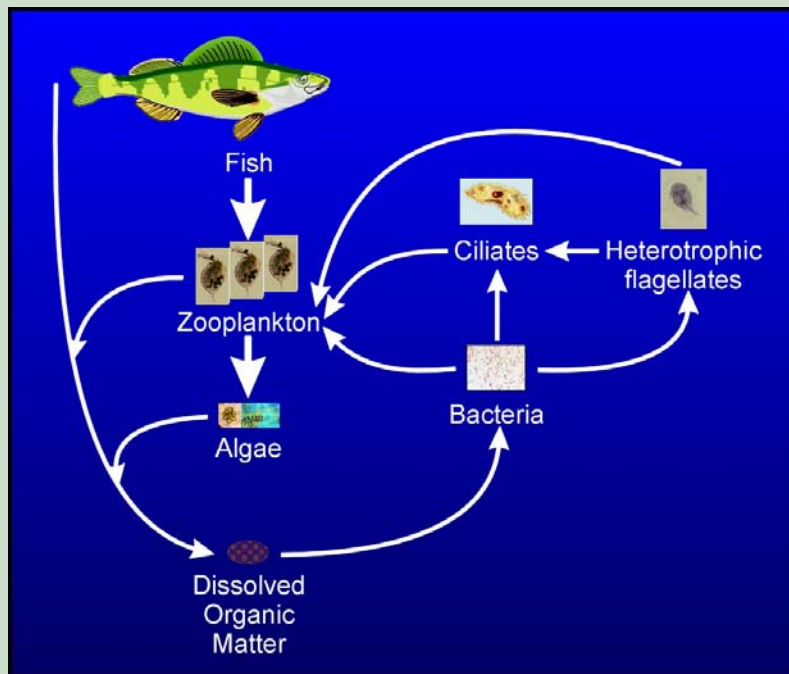
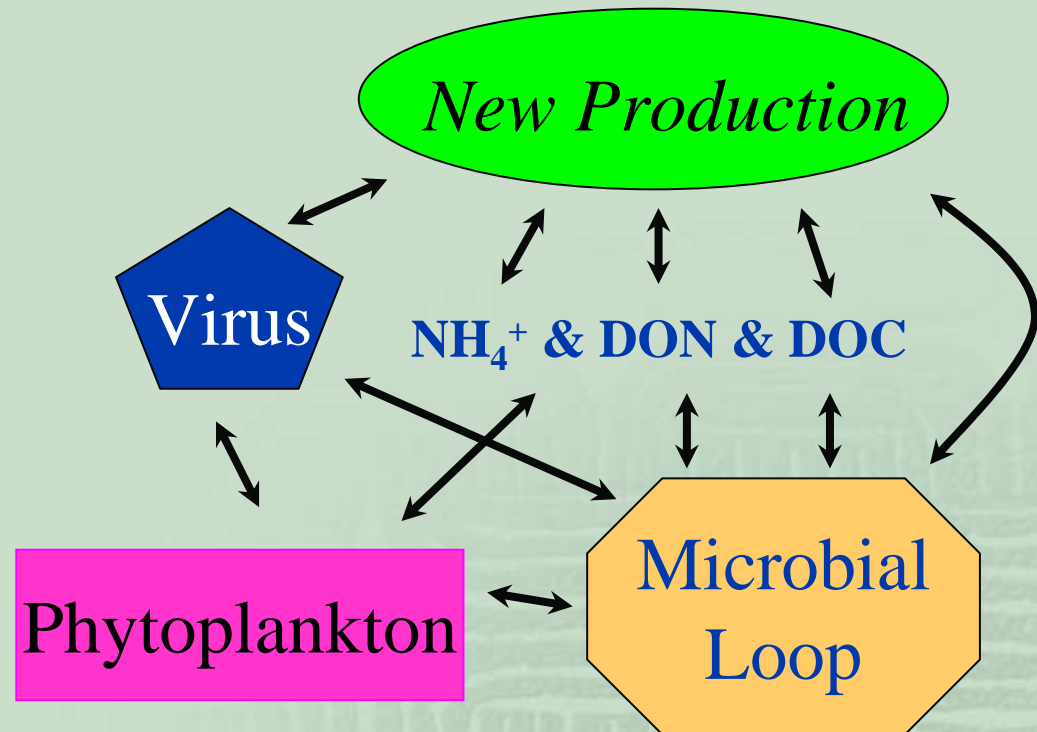




# Simplified Biological Pump



# New Production and Microbial Loop



## 5.4 Marine Plankton Research in China

- 1940's-70's

taxonomy

morphology

field ecology

1958-1960 survey

general biology

热带海洋与全球大气研究(TOGA)

世界大洋环流试验(WOCE)

全球联合海洋通量研究(JGOFS)

海岸带陆海相互作用研究(LOICE)

全球海洋生态系统动力学(GLOBEC)

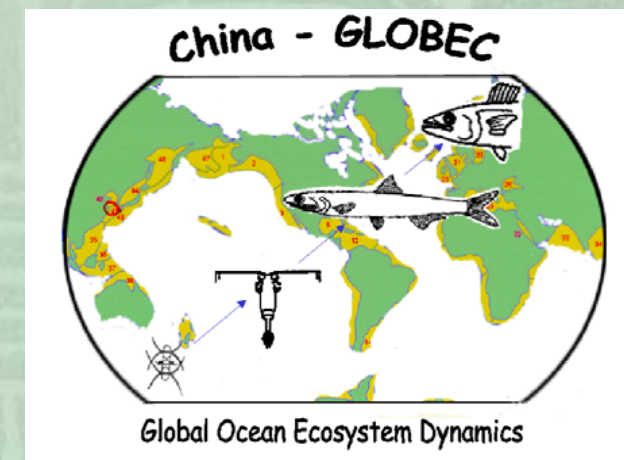
全球海洋观测计划(GOOS)

- 1980's-

experimental ecology

molecular ecology

physiology and biochemistry



## 5 History & Prospects



Prof. Zheng zhong



Prof. Jin Dexiang

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Prof. Li Shaojing



Res. Zhang Jinbiao