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understanding the seas

Zooplankton community structure in the ports of Mumbai, India: An account since 1940's.

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Mumbai

The second largest coastal city in the world

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India's premier port

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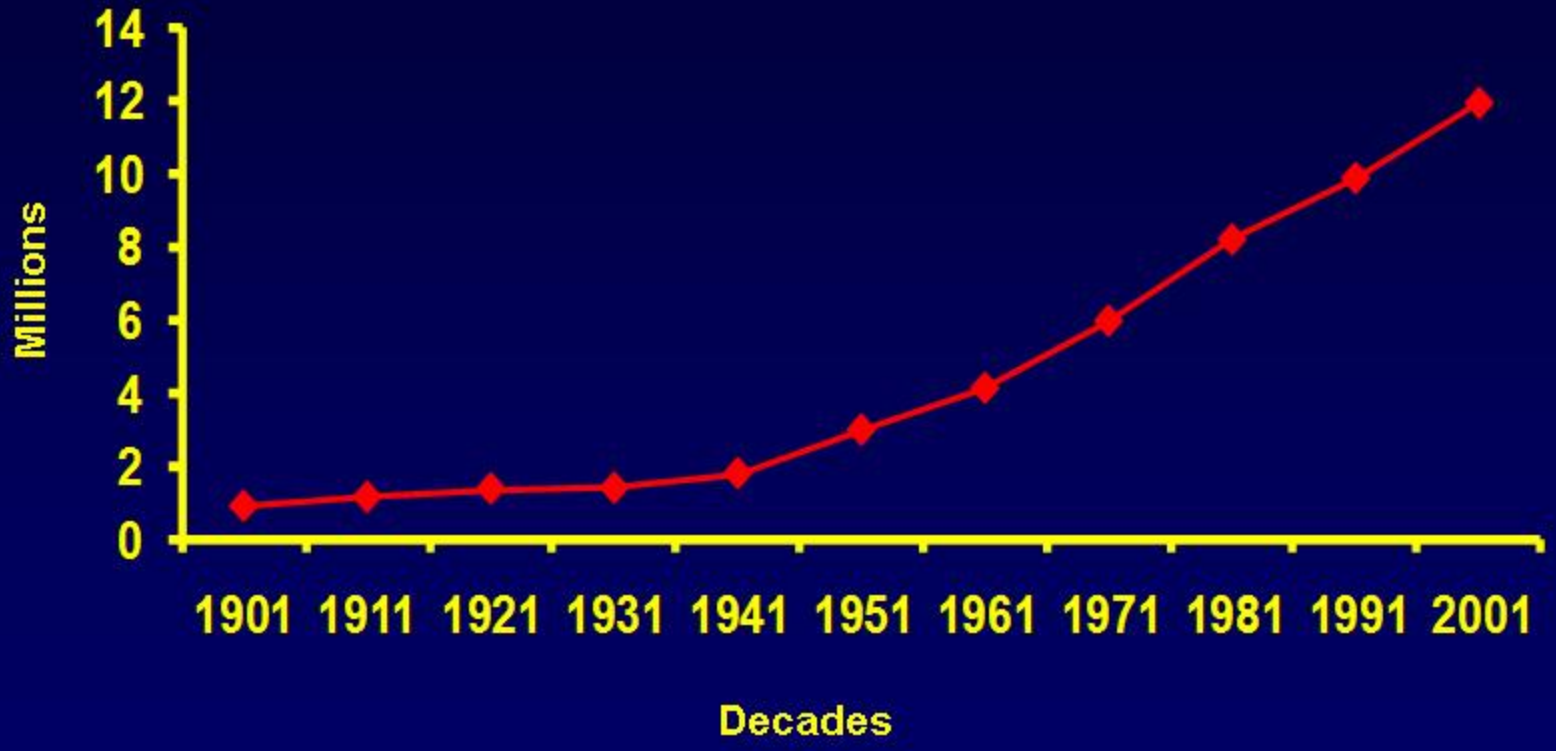
Population growth



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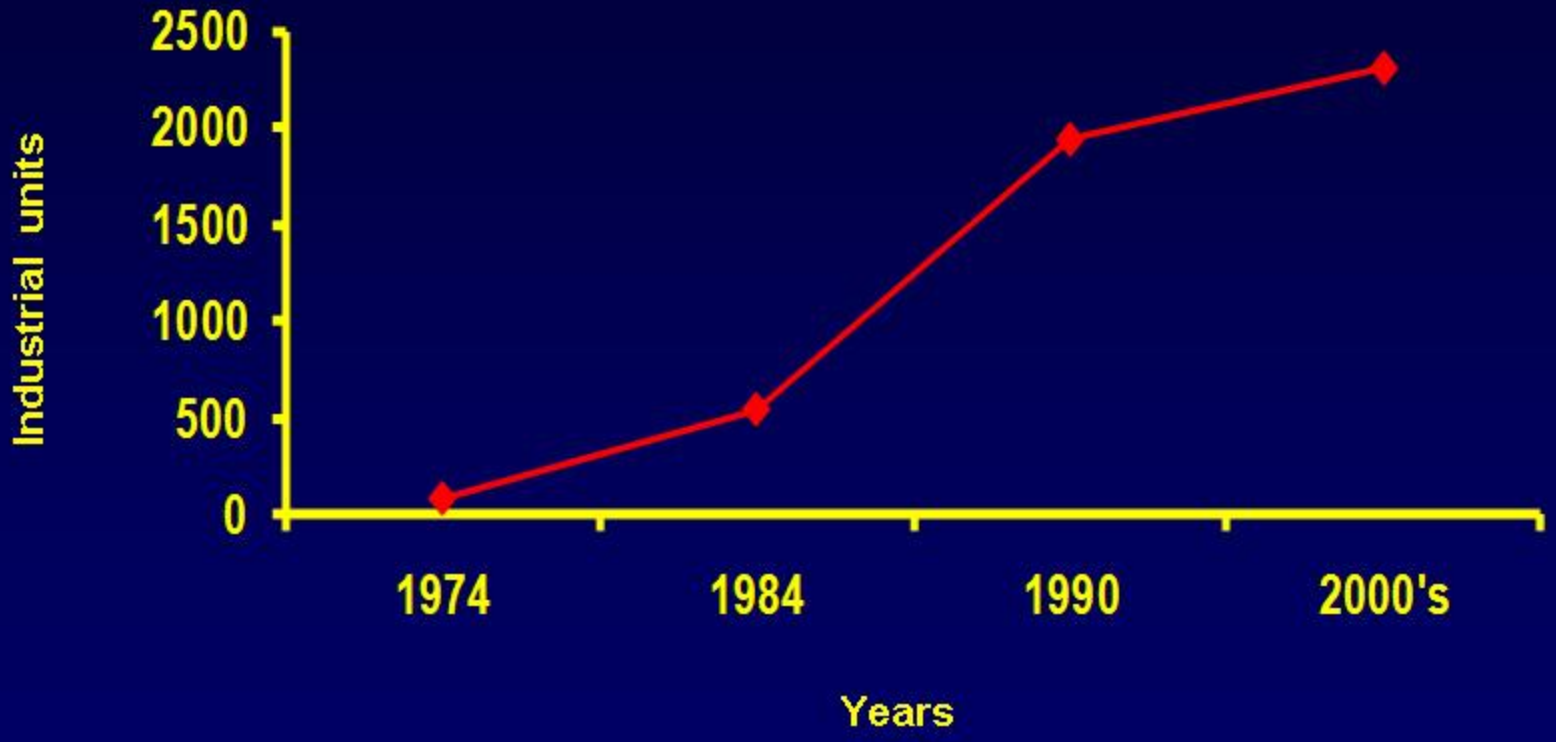
Industrial growth



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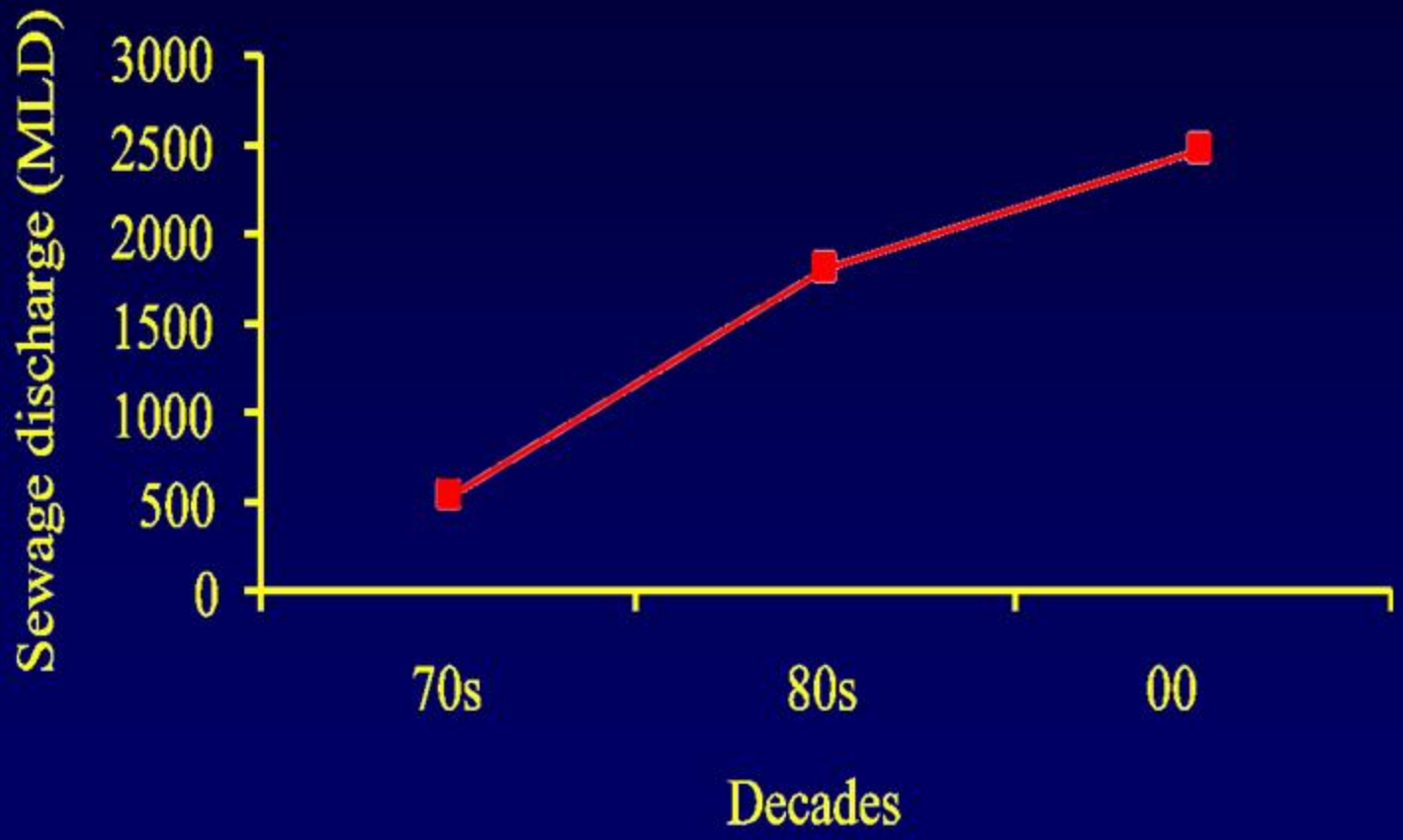
Sewage discharge



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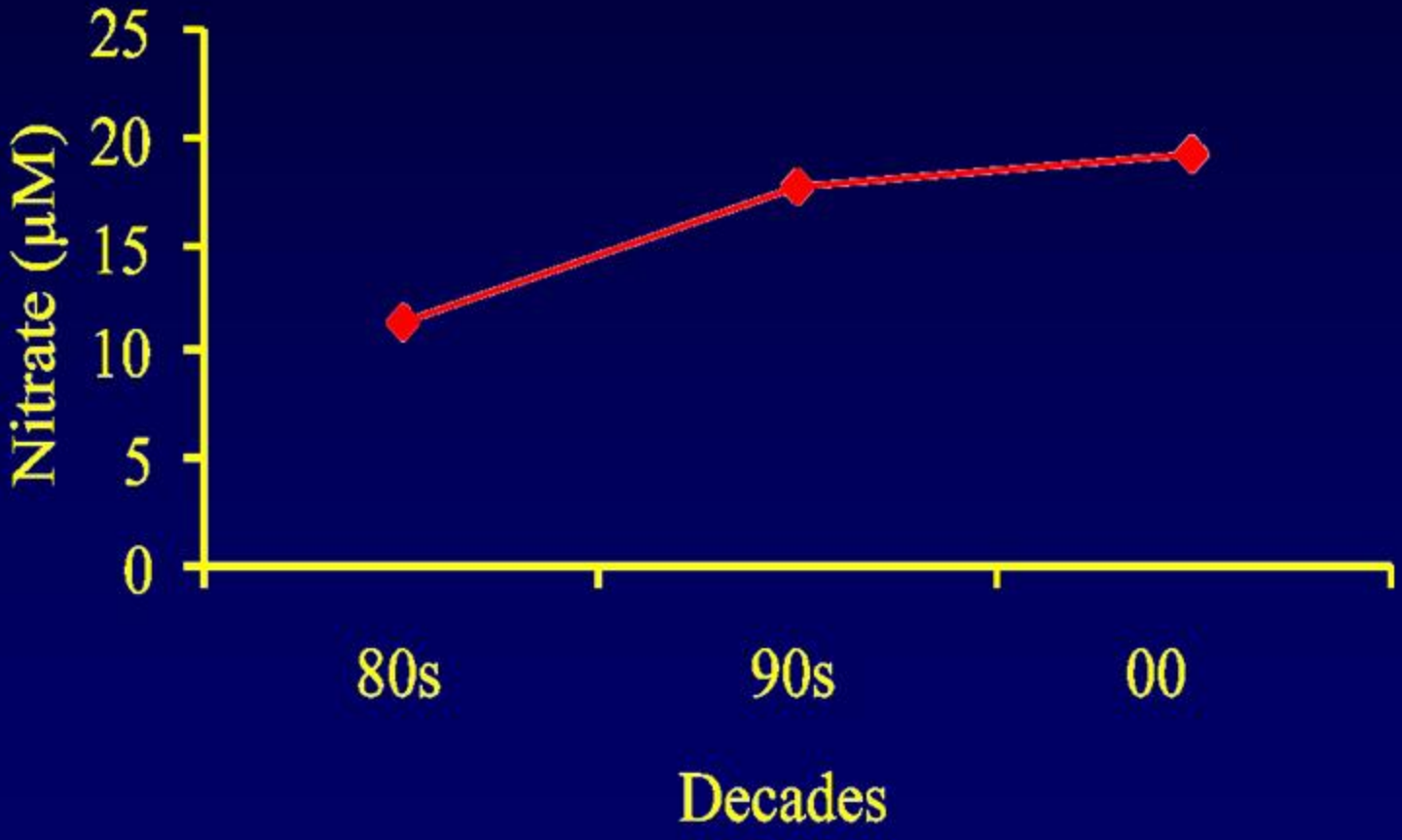
Changes in the environmental scenario

Nitrate



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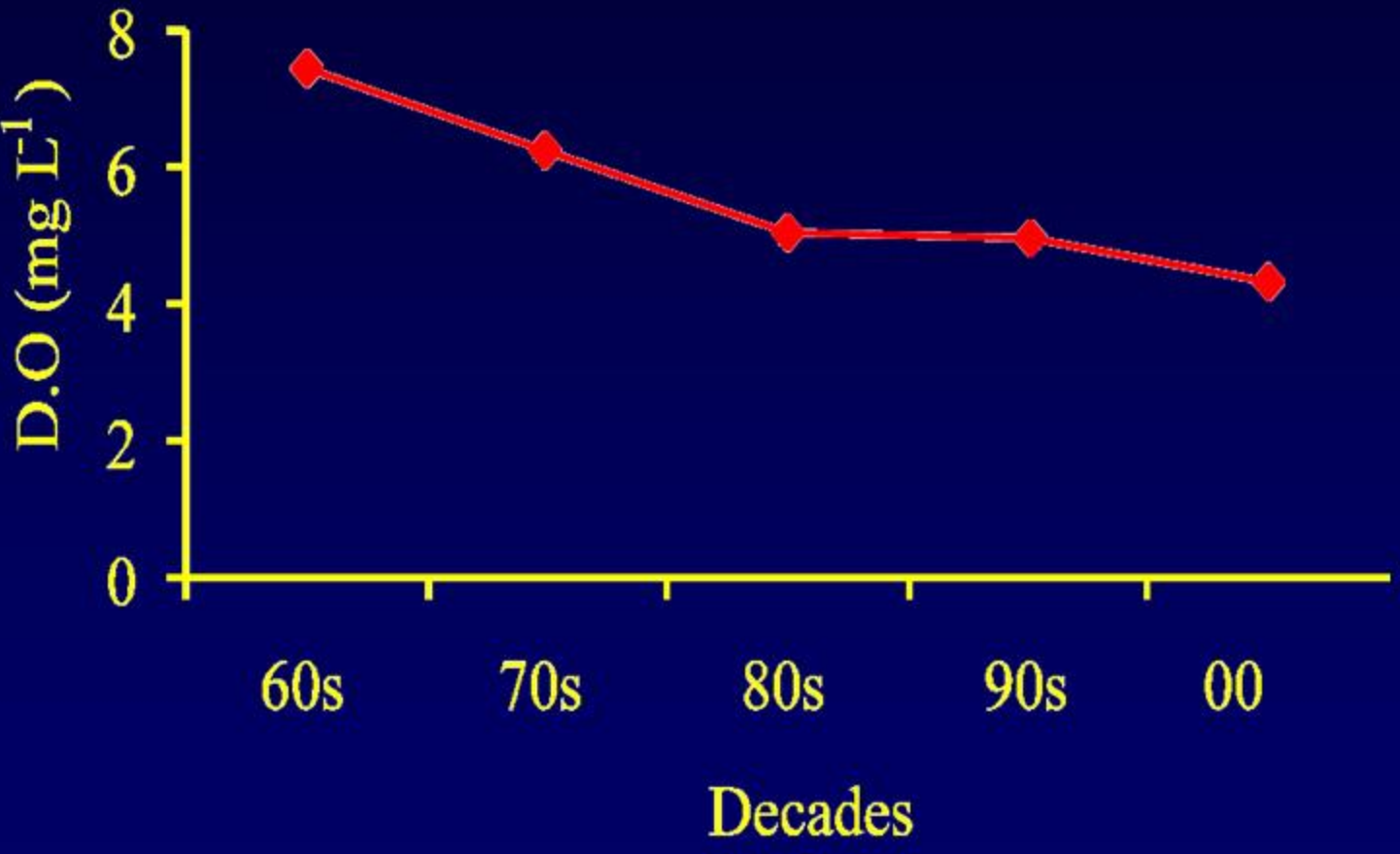
Dissolved oxygen



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Apart from receiving sewage & industrial waste:

Mumbai harbour environment is also subjected to wide range of pollutants and biota through ship ballast water

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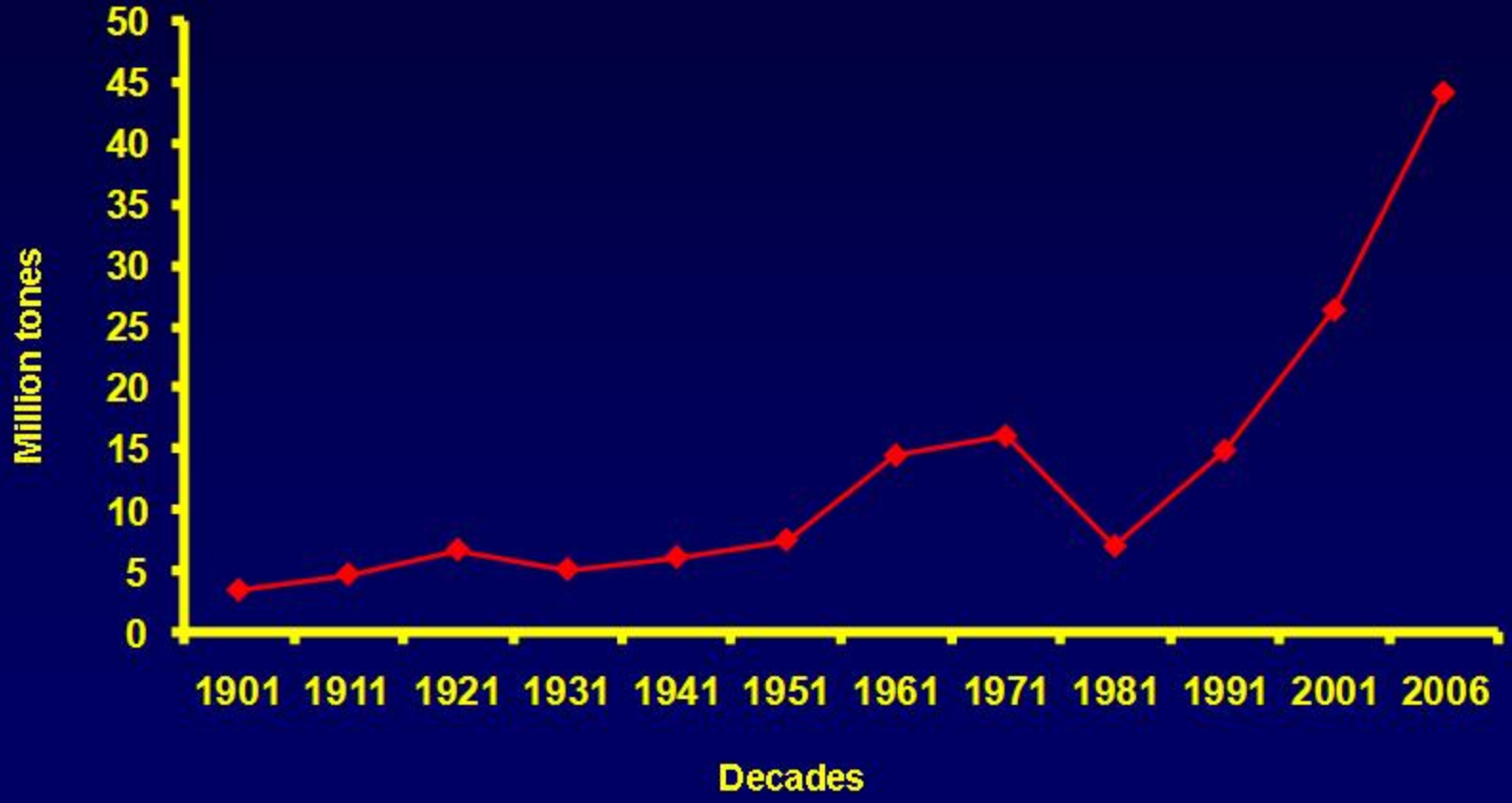
Decadal marine traffic growth (in terms of cargo handled)



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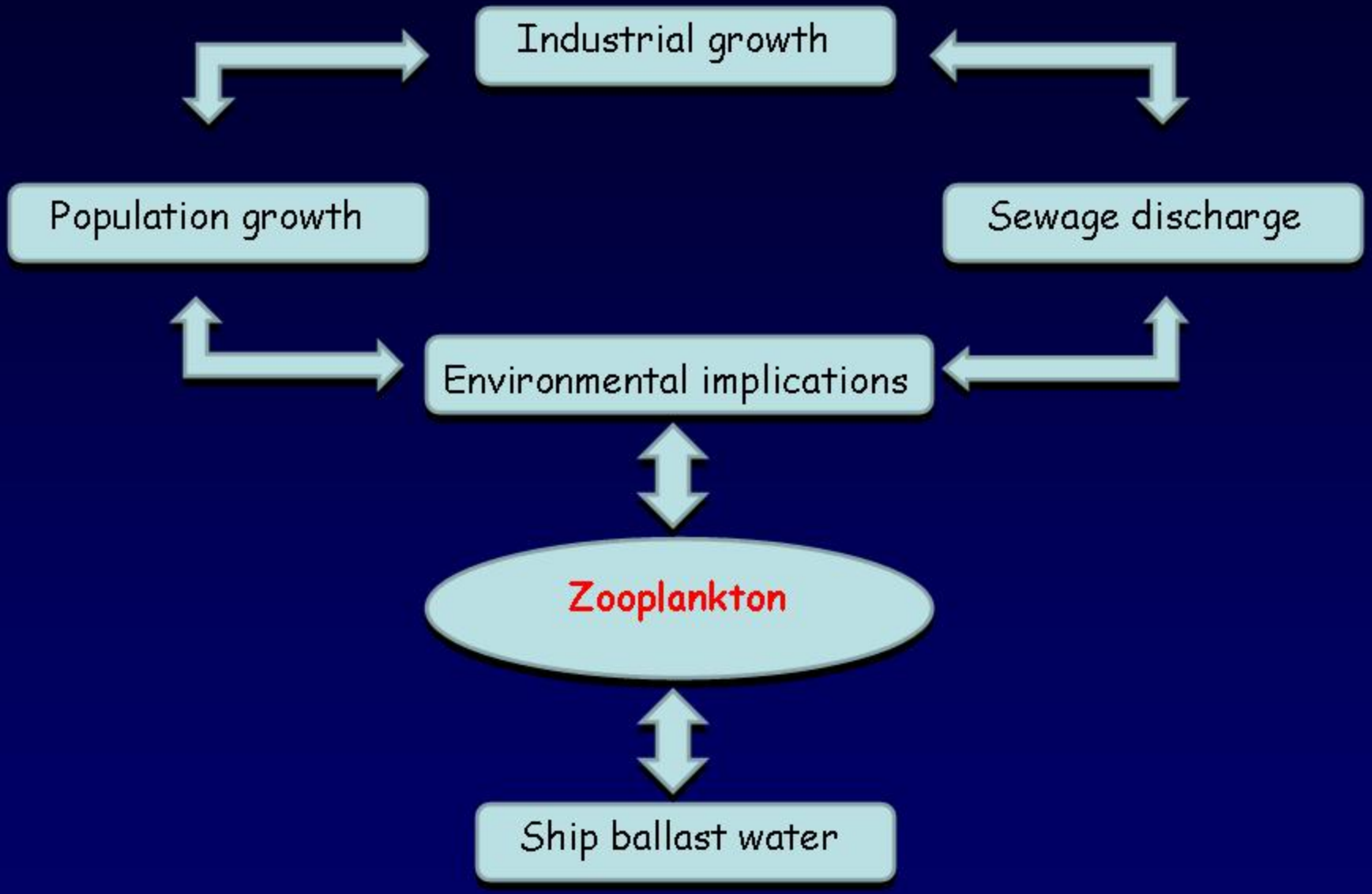
Industrial growth
Population growth
Sewage discharge
Environmental implications
Zooplankton
Ship ballast water

To evaluate the impact of these activities and to elucidate the possible changes in the community structure of zooplankton :

The investigation is carried out in Mumbai port

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Stations

India
Mumbai

72°50'
72°55'
18°00'
18°55'
Pirpau
Mahul creek
Jawahar Dweep
Elephanta
Break yard
Kasara basin
Princess Dock
Ferry warf
Victoria Dock
Mumbai Port Trust
Indira Dock
Berth 20
Custom Jetty
Apollo Bandar
Sassoon Docks
Jawaharlal Nehru Port Trust
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- 14 stations selected in and around the area

- Samples collected during 3 different periods between 2001 & 2002 as a part of Global Ballast Water Management Programme

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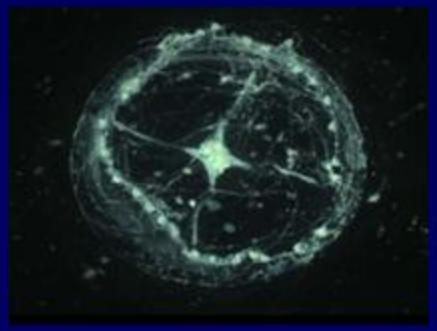
Methodology

- Horizontal hauls made with the help of 100 μ mesh Haron-Trantor net with a flow meter attached

Results

- 25 different zooplankton groups & 23 copepod species recorded



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- But over the years zooplankton abundance has decreased

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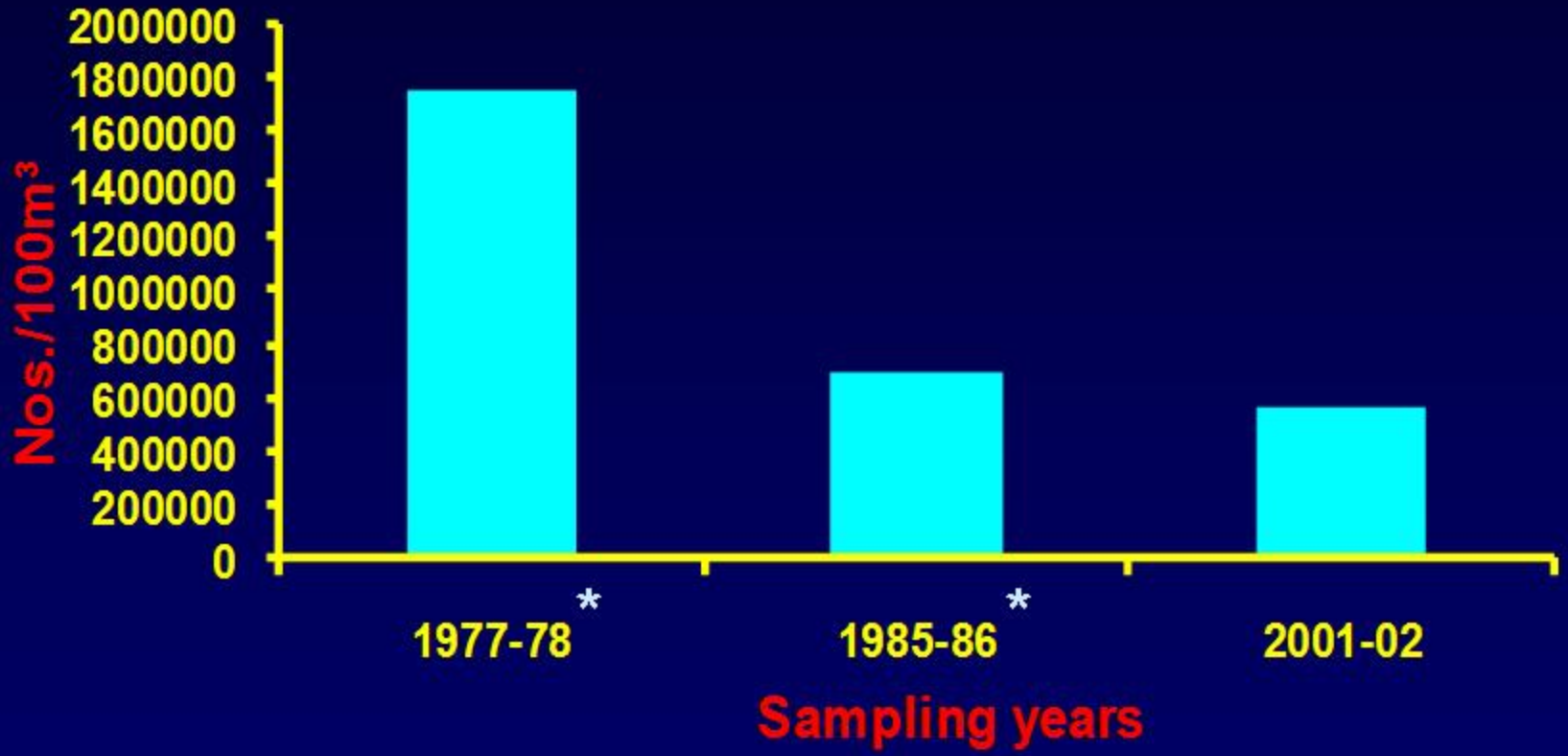
Zooplankton abundance



* Gajbhiye & Desai, Mahasagar, 1981; Lodh, PhD Thesis, Bom, Univ. 1990

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- Data is also compared since 1940’s

Groups not encountered

- Cladocerans
- Ostracods
- Mysids
- Isopods

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Groups recorded

- Cyphonautes larvae
- Ascidian tadepole

Copepods

- *Canthocalanus sp.*
- *Cosmocalanus sp.*
- *Nanocalanus sp.*
- *Tortanus sp.*
- *Euterpina acutifrons*
- *Nanocalanus minor*
- *Paracalanus sp.?*

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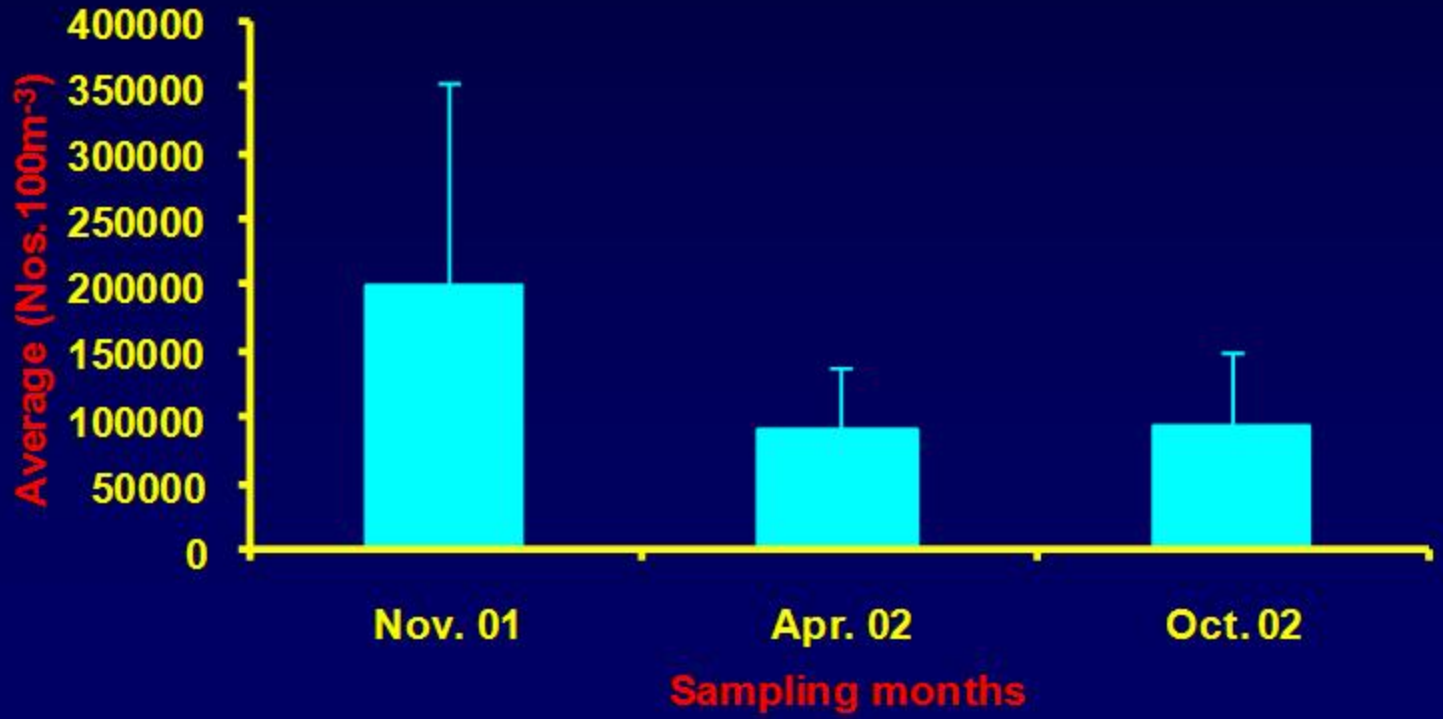
Intersampling variations

Zooplankton total numbers



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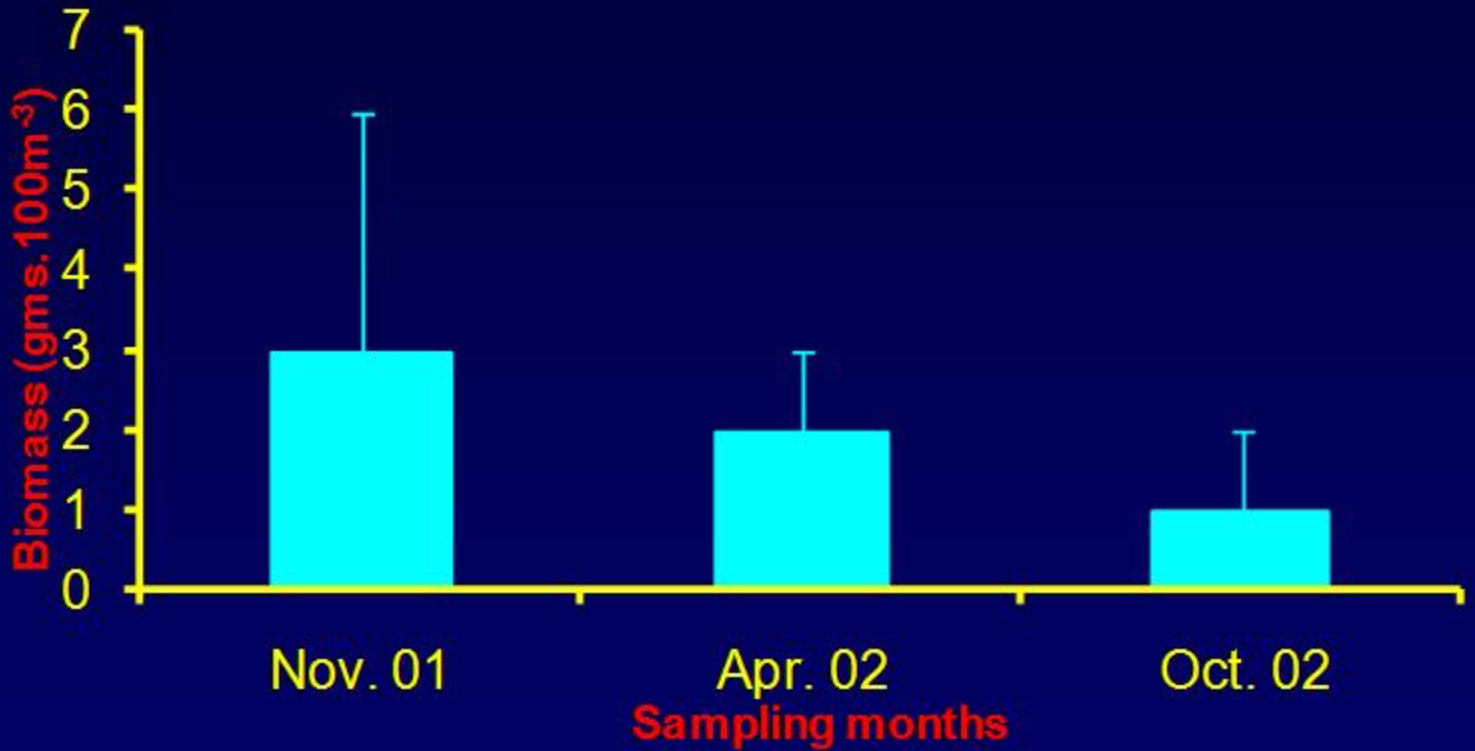
Zooplankton biomass



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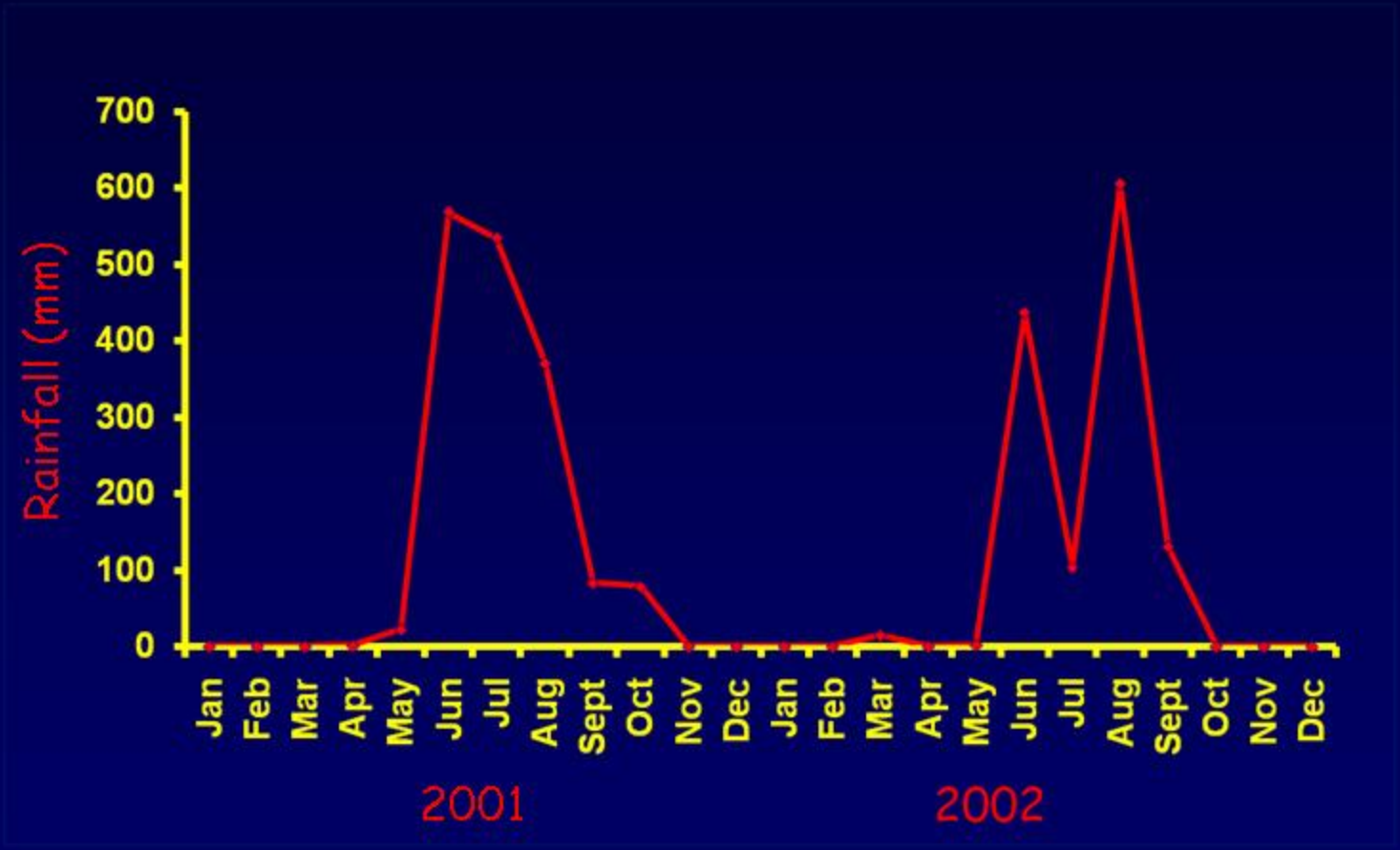
South-West monsoon pattern



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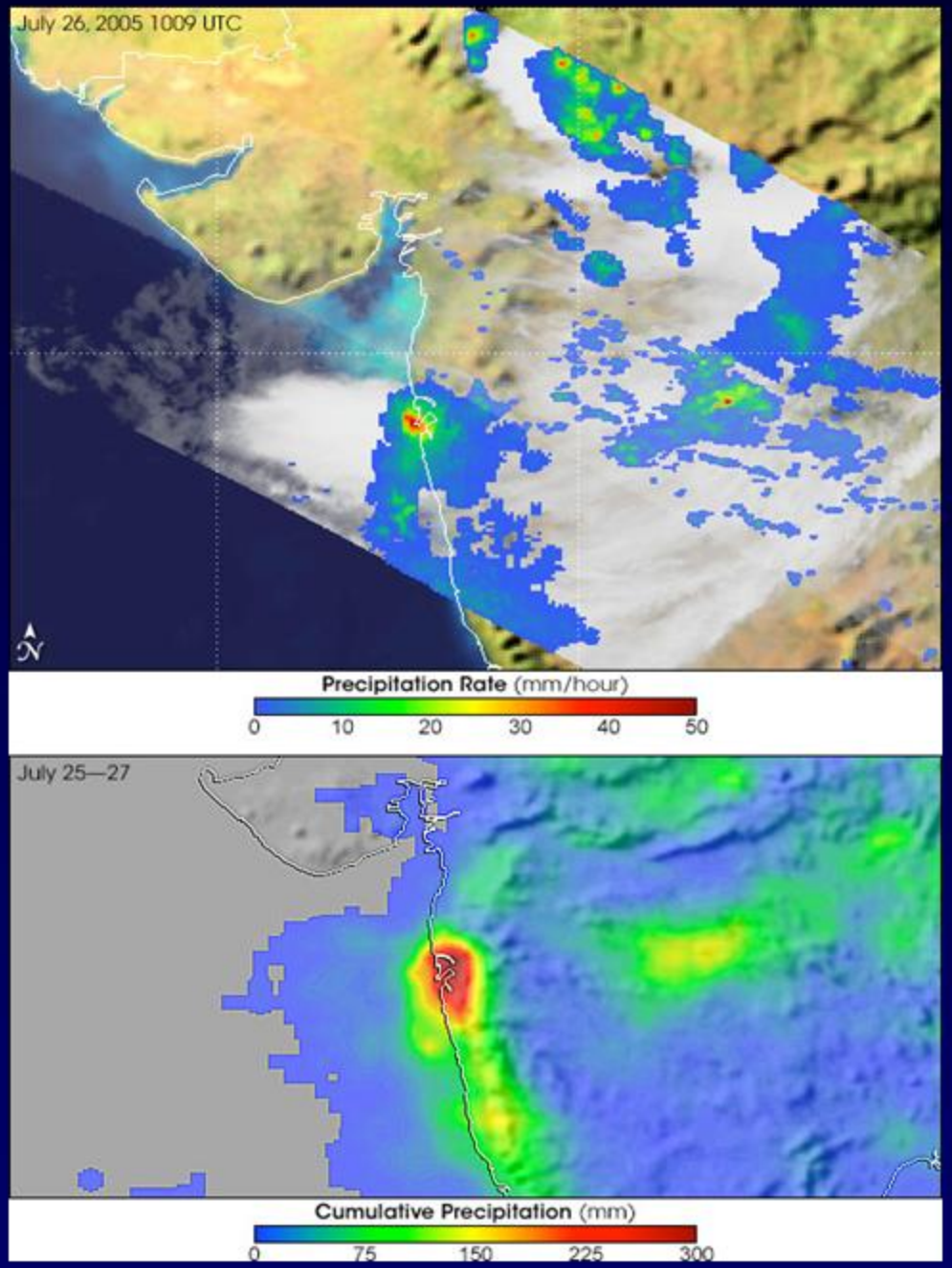
Satellite image of record heavy rainfall in Mumbai



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Phytoplankton community

Diatoms

Nov. 01

Thalassionema nitzschoides dominated

Pleurosigma sp. dominated

Oct. 02

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Dinoflagellates

Nov. 01

Abundance of Autotrophic (Prorocentrum) & Heterotrophic (Protoperedinium) species

Abundance of Mixotrophic (Dinophysis) species

Oct. 02

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Copepod community

Nov. 01

Absence of
Microsetella sp. & *Oncea sp.*

Absence of
Acartia centrura & *Nanocalanus sp.*

Oct. 02

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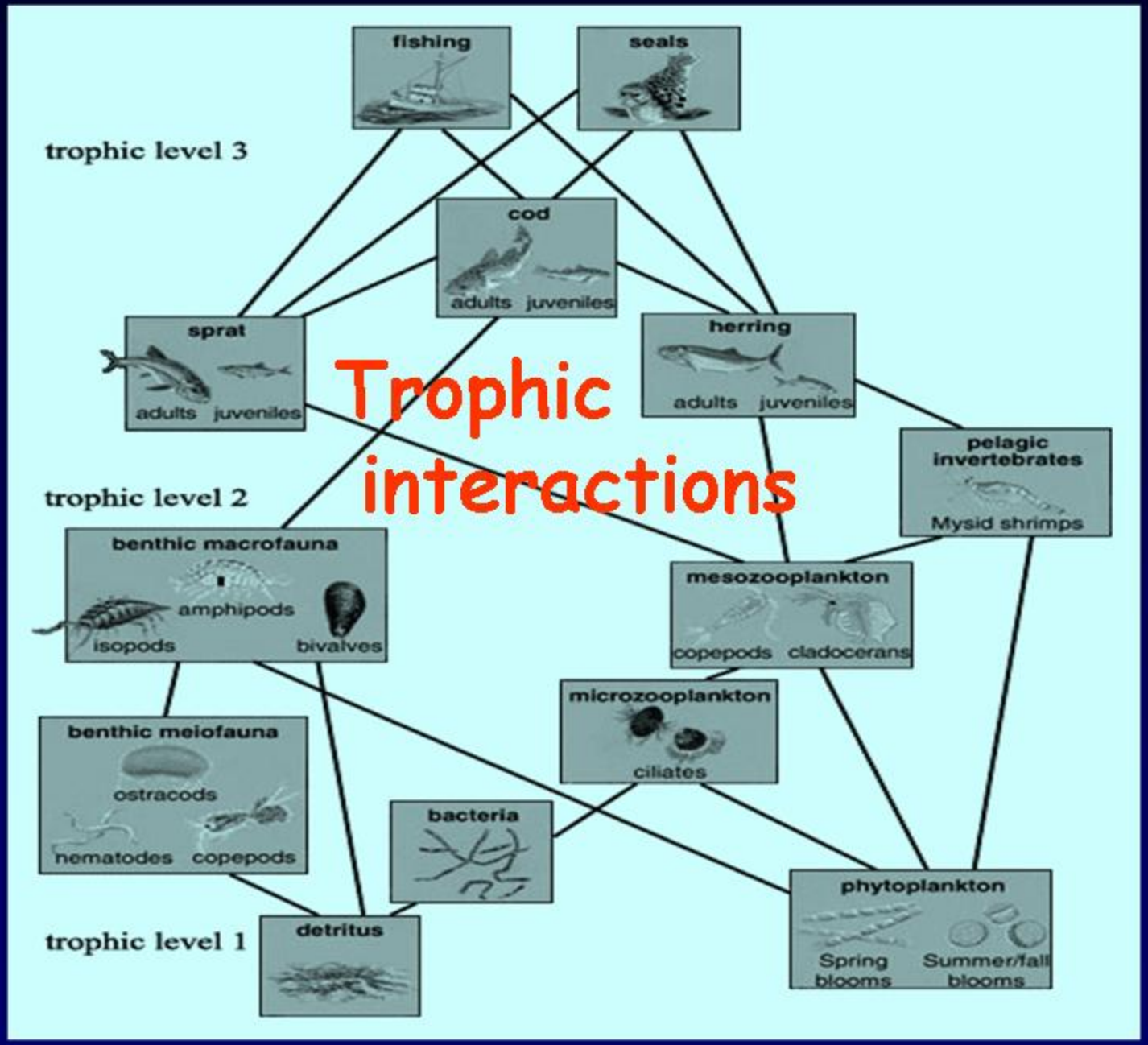
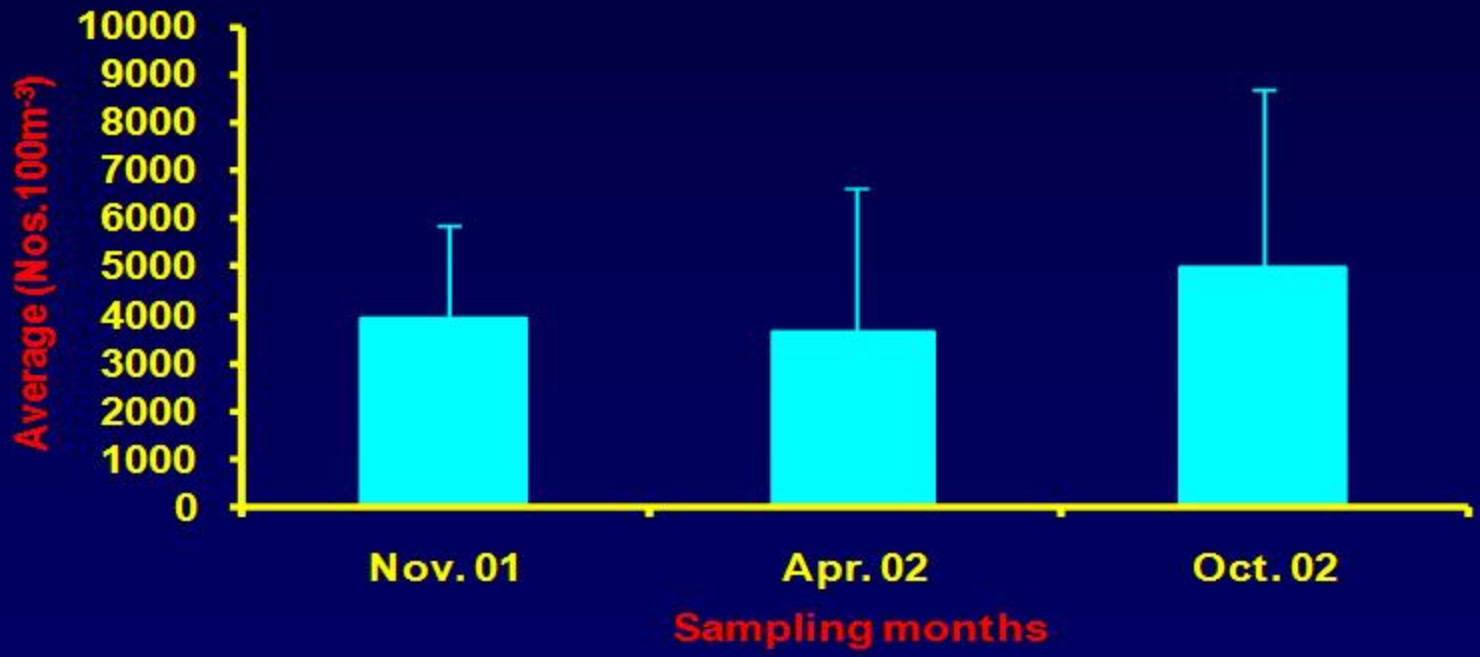

fishing
seals
trophic level 3
cod
adults juveniles
sprat
adults juveniles
herring
adults juveniles
Trophic interactions
pelagic invertebrates
Mysid shrimps
trophic level 2
benthic macrofauna
amphipods
isopods
bivalves
mesozooplankton
copepods cladocerans
microzooplankton
ciliates
benthic meiofauna
ostracods
nematodes copepods
bacteria
phytoplankton
Spring blooms
Summer/fall blooms
trophic level 1
detritus

Zooplankton



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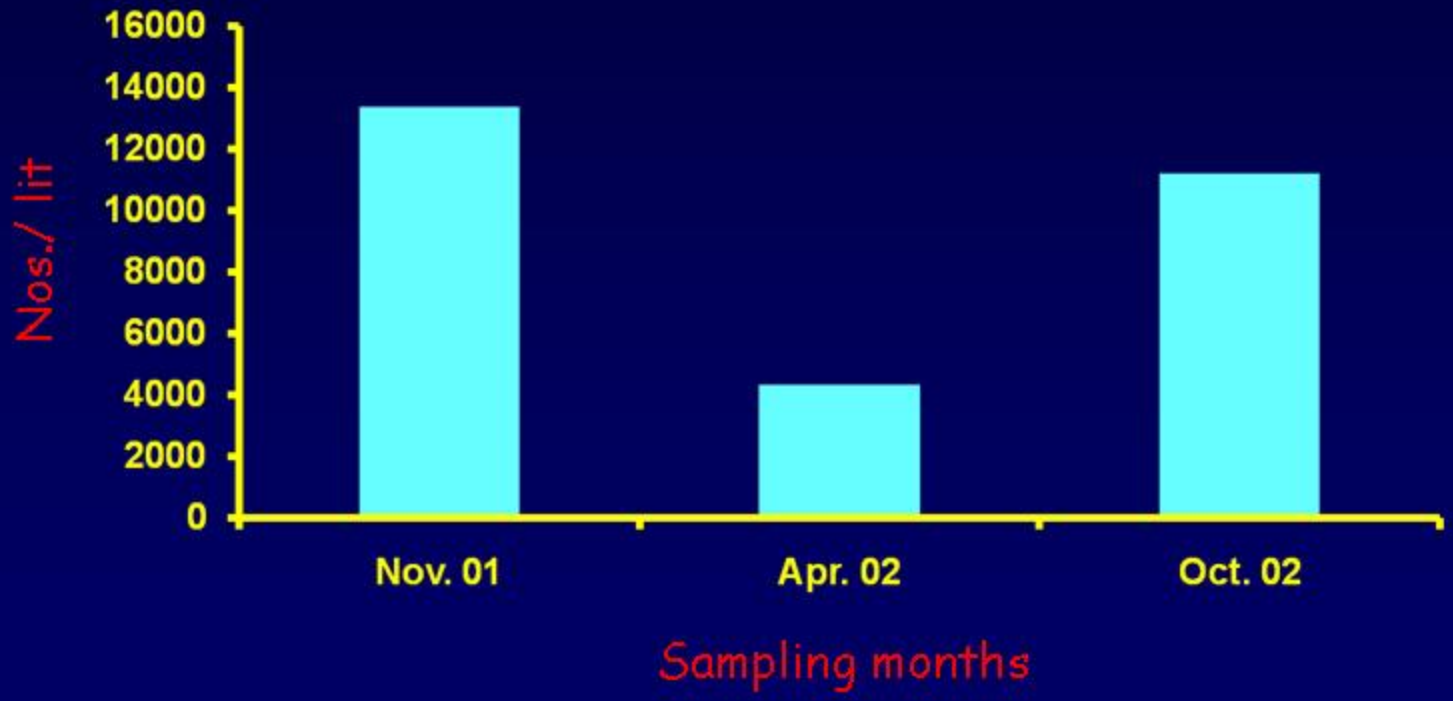
Phytoplankton



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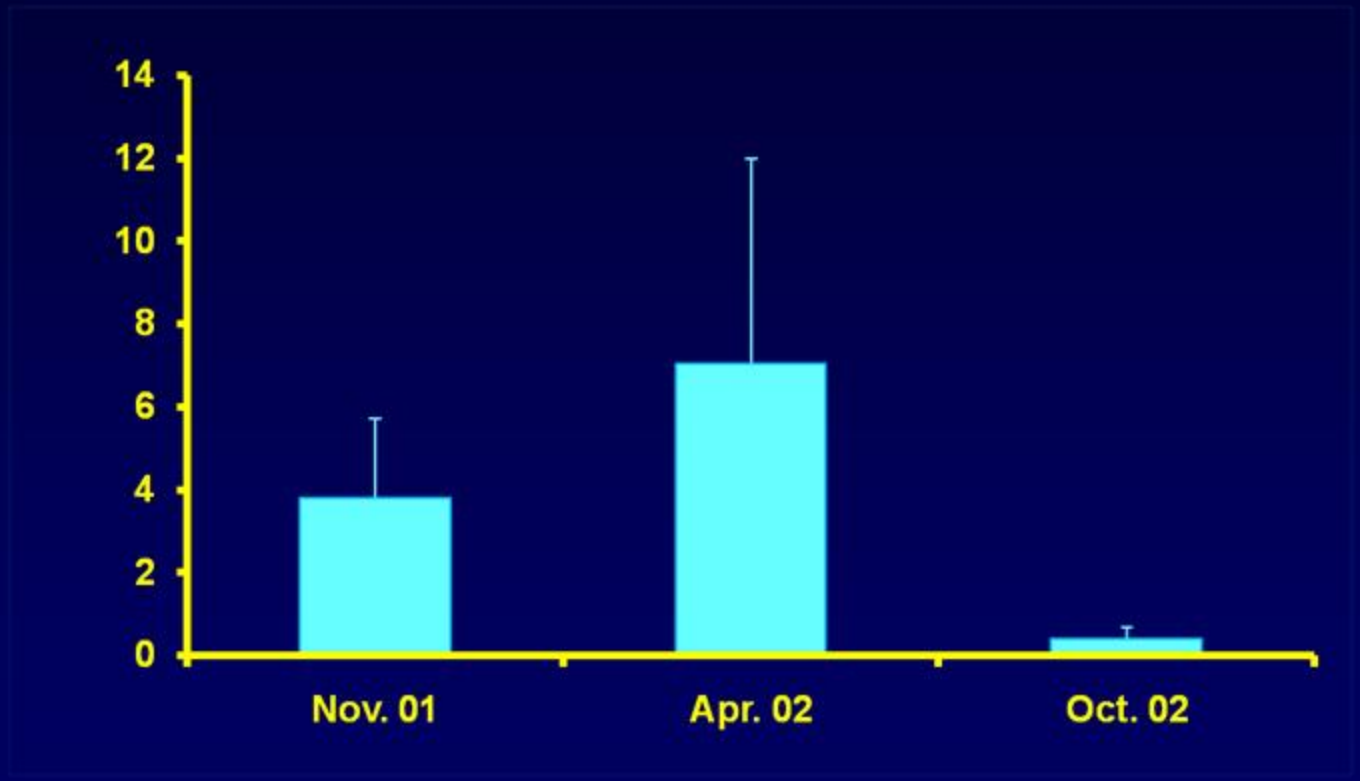
Bacteria



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Copepods

Herbivorous

Nanocalanus minor
Temora discaudata
Paracalanus sp.

Least % of occurrences
during pre-monsoon sampling

Attributed to low availability
of total phytoplankton

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Carnivorous

Tortanus barbatus

Omnivorous

Centropages furcatus
Oithona sp.
Corycaeus sp.

↓

Abundant during pre-monsoon sampling

↓

Attributed to low phytoplankton & increased bacterial numbers

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In conclusion:

- A reflection of mesozooplankton population provides indicative changes in the community structure
- Delineating the causative factors is limited by the methods employed and the observational focus

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Thank you