STUDIES ON PLANKTON COMMUNITIES OF FISHING HARBOUR ; BAY OF BENGAL, VISAKHAPATNAM, EAST COAST OF INDIA.

Project submitted to the Andhra University for partial fulfilment for the award

of the degree of

MASTER OF SCIENCE IN ZOOLOGY

Presented by

KATARI ANUSHA

UNDER THE GUIDANCE OF

DR.V. RATNA BHARTHI , MSc., M.Phil., Ph.D

DEPARTMENT OF ZOOLOGY

DR .V.S KRISHNA GOVERNMENT DEGREE & PG COLLEGE(A)

VISAKHAPATNAM -- ANDHRA PRADESH

Dr.V.S.KRISHNA GOVT. DEGREE COLLEGE

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VISAKHAPATNAM

CERTIFICATE

This is to certify that the project work entitled **"STUDIES ON PLANKTON COMMUNITIES OF FISHING HARBOUR" : BAY OF BENGAL, VISAKHAPTNAM, EAST COAST OF INDIA ,** submitted to the Department Of Zoology, DR V. S. Krishna Government Degree & Pg College (Autonomous) Visakhapatnam is a bona fide record of the research work carried out by **KATARI ANUSHA** of degree of Master of Science in Zoology.

EXAMINAR P.G COORDINATOR

Dr. T. SAMUEL DAVID RAJ

DECLARATION

Hereby declare that the dissertation titled "**STUDIES ON PLANKTON COMMUNITIES OF FISHING HARBOUR; BAY OF BENGAL, VISAKHAPATNAM, EAST COASTOF INDIA"** is submitted to the department of Zoology, DR V S Krishna Government Degree & PG college in partial fulfilment of the requirement for the award of the M.Sc., Degree in Zoology. The work is original and has not been submitted in part or full for any other diploma or degree to this or any other university.

Visakhapatnam

Date:

KATARI ANUSHA

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ABSTRACT:

The present work on Plankton communities of fishing harbour was carried out for a period of 2 weeks at regular intervals revealed three major types of communities namely phytoplankton, proto zooplankton and meta zoo plankton. Of these 18 species are of phytoplankton, 9 species belonging to proto zoo plankton and 4 species belonging meta zoo plankton were observed during the study. The methods involved in collection of samples and qualitative analysis of the samples were discussed detailed manner in the project.

1. INTRODUCTION

The name plankton is derived from the Greek word Plankton which means Wanderer [OR] Drifter . Plankton are the diverse collection of organisms found in water that are unable to propel themselves against a current [or] wind. The individual organisms constituting plankton are called Plankters. In the ocean, they provide a crucial source of food to many small and large aquatic organisms, such as Bivalves, Fish And Whales.

MARINE PLANKTON;

Includes bacteria, archaea, algae, protozoa and drifting [or] floating animals that inhibit the salt water of oceans and brackish water of estuaries. Fresh water plankton are similar to Marine water plankton, but are found in lakes and rivers. Many planktonic species are Microscopic in size , plankton includes organisms over a wide range of sizes, including large organisms such as Jelly fish. This is because plankton are defined by their Ecological Niche and levels of Motility rather than by any Phylogenetic [or] Taxonomic Classification. Technically the term does not include organisms on the surface of the water is called as Neuston [or] those that swim actively in the water called Nekton. Which is composed of strong swimming animals and form bentos. Which includes sessile , creeping.

ROLE OF PLANKTON;

Marine planktons are significant in maintaining the balance & health of the water body and their complex food webs. Nutrients, oxygen and biomass it produces also sustains the terrestrial ecosystem. On the basis of various tropic levels and characteristics, planktons are classified as;

1. PHYTOPLANKTON
2. ZOOPLANKTON

1.PHYTO PLANKTON

Phyto plankton are the Autotrophs [self feeding] components of plankton community and a key part of ocean and fresh water ecosystems. The names comes from the Greek word Phyton Which means Plant and plankton meaning Wander or Drifter. Phytoplankton obtain their energy through the Phyto synthesis as do trees and other plants on land. This means phytoplankton must have light from the sun, so they live in the well-lit surface layers called as Euphotic Zone of oceans and lakes. In comparison with terrestrial plants, phytoplankton are distributed over a large surface area, are exposed less seasonal variation and have markedly faster turnover rates than trees. As a result phytoplankton respond rapidly an a global scale to climatic variations. Phytoplankton from the base of marine and fresh water food webs and are key players in the global Carbon Cycle. They account for about half of global photosynthetic activity and at least of the oxygen production despite amounting to about 1% of the global plant biomass. Most phytoplankton are too small to be individually seen with the Unaided eye. However, when present in high enough numbers. Some varieties may be noticeable as clored patches on the water surface due to presence of Chlorophyl within their cells and accessory pigments such as Phycobiliproteins or Xanthophylls. The term plankton was coined by Victor Hensen in 1887, denotes collectively all free floating and suspended bodies, both plants and animals ,living or dead ,that essentially move passively in a body of water. The phytoplankters are the microscopic plant life of the sea, which constitute the primary producers synthesize the basic food. It belongs to the class algae, which besides chlorophylls posses other characteristics pigments.

The important components of phytoplankton are Diatoms, phytoflagellates [Dinoflagellates], Blue- green algae. Phytoplankton nannochloropsisIn addition to these, two other classes namely Silico flagellates Coccolithophores also belong to the category of phytoplankton. In the sea water, the diatoms and dinoflagellates are the more obvious representative of the phytoplankton in terms of both cell size and availability when water sample are examined under microscope. Depending on size on the size grading of phytoplankton organisms they are grouped under:

1. More than 1mm : Macroplankton
2. less than 1mm : Microplankton
3. Organisms of 5-50um : Nano plankton
4. Less than 5 um : Ultra plankton
5. less than 1 um : Pico plankton

Characteristics of phytoplankton:

Most phytoplankton organisms are unicellular. The larger colonial formsposses individual cells that are usually of uniform structure and appearance. Some planktonic green algae are of filamentous organismsorganisation, and in some and dinoflagellates chains of loosely certain cell characteristics and ease of identification will clearly be limited by cell size and the degree of magnification obtainable For identification purpose we look for the following with phytoplankton organisms:1. Cell shape 2. Cell dimension 3.Cell wall 4.Mucilage layer 5.Chloroplast 6. Flagella and 7. Reserve substance.

Types of phytoplankton;

Based on cell wall arrangement and cell structure the phytoplankton are classified into five types ;

1. Diatoms
2. Dinoflagellates
3. Blue green algae
4. filamentous

DIATOMS

A diatom is any member of a large group comprising several genera of algae, specifically micro algae, found in oceans, water ways and soils of the world. Living diatoms make up a significant portion of earth's Biomass. Diatoms are Unicellular organisms they occur either as solitary cells or in Colonies. Which can take the shape of ribbons, fans, stars.

Morphological characters of diatoms

Diatoms are single -celled organisms which secrete Intricate Skeleton .These may be elongate with a bilateral plane of symmetry [or] they may be round and radially symmetrical. The skeleton of a diatom [or] frustule is made of very pure silica coated with a layer of organic material. The skeleton is divided into Epitheca& Hypotheca. Pennate diatoms show a long slit, the Raphe, along the axis. Within their silica walls'Diatoms shows a typical level of Eukaryotic Organization.

DINOFLAGELLATES

The dinoflagellates are a Monophyletic group of single celled eukaryotes constituting the phylum Dinoflagellate. Many dinoflagellates are photosynthetic but a large fraction of these are in fact Mixotropic, combining photosynthesis with ingestion of prey. Some species are Endosymbionts of marine animals and play an important part in the biology of Coral reefs.

MORPHOLOGICAL CHARACTERS OF DINOFLAGELLATES

Dinoflagellates are unicellular and possess two dissimilar flagella arising from the ventral side. They have a ribbon like transverse flagellum with multiple waves that beats to the cell's left and a more conventional one. Dinoflagellates have a complex cell covering called an Amphiesma [OR] Cortex compared of series of membranes flattened vesicles called Alveoli.

Examples;-

Noticula, Gonyalax

BLUE GREEN ALGAE

Cyanobacteria also known as cyanophyta are a phylum of Gram Negative Bacteria that obtain energy via Photosynthesis. Cyanobacteria use Photosynthetic pigments such as Carotenoids, phycobilin and various forms of chlorophyll which absorb energy from light. These have flattened sacs called Thylakoids where photosynthesis is performed. Cyanobacteria are the first organisms known to have produced oxygen.

MORPHOLOGICAL CHARACTERS OF BLUE GREEN ALGAE

These are unicellular and filamentous to colonial forms. Many cyanobacteria form motile filaments of cells called Hormogonia that travel away from the main biomass to bud and form new colonies elsewhere. To break away from the parent colony, a hormogonium often must a part a weak cell in a filament called Necridium.

Examples;- Anabaena ,Nostoc

FILAMENTOUS ALGAE

The name algae refers to broad and immensely diversely group of photosynthetic eukaryotic life forms. These organisms are not related since they do not have a common ancestor. Algae can be found in a variety of habitat , including seas, rivers, and lakes as well as ponds, brackish water and even snow. Algae are often green in colour however they can come in a range of different colours. Filamentous algae are microscopic algae that create threads or mesh like filaments by linking themselves.

EXAMPLES ;

Spirogyra and Ulothrix are examples of filamentous algae. Spirogyra is free floating green algae that can be found in ponds,lakes, and other fresh water environments. The vegetative structure of these algae is filamentous and unbranched. Ulothrix is a filamentous green algae genus found in both fresh and salt water.

ZOO PLANKTON

Zooplankton are the animal component of the planktonic community . ZOO comes from the Greek word for animal. Zooplankton can be contrasted with phytoplankton which are the plant component of the plankton community. Zooplankton are Heterotrophic. Whereas phytoplankton are Autotropic [Self Feeding]. In other wordzooplankton connect manufacture their own food. Rather, they must eat other plants or animals instead. Most zooplankton are Microscopic but some [such as jelly fish] are Macroscopic. Zooplankton can be classified into 2 types

1. Micro Zooplankton
2. Macro Zooplankton

MICRO ZOO PLANKTON

Micro zooplankton are defined as Heterotrophic and Mixotrophic plankton. They are primarily consists of Phagotrophic Protists including Ciliates, Dinoflagellates. As the primary consumers of marine phytoplankton, micro zooplankton consume 59-75% daily of the marine primary production. Despite their ecological importance micro zooplankton remain understudied. Routine oceanographic observations seldom monitor microzooplankton biomass or herbivory rate, although the dilution technique, an elegant method of measuring micro zooplankton herbivory rate has been developed for almost four decades [Landry and hassett 1982]. The number of observation of microzooplankton herbivory rate is around 1600 globally far less that of primary productivity [>50,000]. Micro zooplankton are also pivotal regenerators of nutrient which fuel primary production and food sources of metazoans. Micro zooplankton can be classified into 3 major types. 1. Zoo flagellates 2. Ciliates 3. Copepods of whcih ciliates and copepods are predominant forms of zooplankton.

1. CILIATES

Ciliates are a group of protozoans characterized by the present of hair like structures called cilia. Which are identical in structure to eukaryotic flagellum but are in general shorter and present in much larger numbers with a different undulating patterns. . Cilia occurs in all members of the group and are variously used in swimming, attachment feeding and sensation. Ciliates reproduce asexually by various kinds of fission. Most ciliates are heterotrophs feeding on smaller organisms such as bacteria and algae and detritus swept into the oral groove by modified oral cilia.

2. COPEPODS

Copepods are group of small crustaceans found in nearly every freshwater and saltwater habitat. Copepods are sometimes used as Biodiversity Indicators. Copepods vary considerably but are typically 1 to 2 mm [1/32 to 3/32 in] long, with a teardrop shaped body and large intestine. Like other crustaceansbut they are so small that in most species, this thin armour and the entire body is almost totally transparent. Most copepods have a single median compound eye, usually bright red and in the centre of the transparent head. Because of their small size, copepods have no need any heart [or] circulatory system and most also lack gills. Instead they absorb oxygen directly into their bodies, their excretory system consists of maxillary glands.

Eg; calanoida, cyclops, cyclopoida

REVIEW OFLITERATURE

The enormous impact that marine phytoplankton have on global biogeochemical cycles and marine ecosystem functioning largely motivates which aspects of their ecology, physiology and evolution are routinely measured. Often, their diversity is divided into functional groups based on metabolic capacity and impact on biogeochemical cycles (DeLong 2009; Fuhrman 2009.

Phytoplankton form the base of marine food webs and comprised a taxonomically broad range of organisms that includes both prokaryotes and eukaryotes and consists of thousands of species (Falkowski and Raven 2007). The relative contribution of different taxa to primary production influences the export of organic carbon to the deep ocean, termed the 'biological pump' (Volk and Hoffert 1985; De La Rocha and Passow 2007). Different taxa differ in size and composition of their cell walls and coverings, which influence their sinking rates and thus their impact on the biological pump. For example, the smallest constituents of the marine phytoplankton are the picoplankton (0.2–2 μm), which include taxa such as cyanobacteria and prasinophytes, and sink slowly, at rates of < 0.5 m/day (Bach et al. 2012). In contrast, larger cells such as diatoms are covered in biogenic silica, which acts as ballast, and accelerates their sinking to rates of up to 35 m/day (Miklasz and Denny 2010). Coccolithophores are commonly covered with calcium carbonate plates called 'coccoliths', which also acts as a ballasting agent, yielding sinking rates of nearly 5 m/day (Bach et al. 2012). In addition to ballast material, processes such as aggregation and the packaging of small cells into large faecal pellets by grazers also affects sinking rates and the efficiency of the biological pump (Klaas and Archer 2002; De La Rocha and Passow 2007).

Given their phylogenetic breadth, different phytoplankton taxa will likely have different responses to climate change. For example, it has been suggested that decreased ocean pH may hinder the ability of coccolithophores to generate calcareous plates, potentially influencing their impact on the biological pump (Riebesell et al. 2000; Langer et al. 2009; Hoppe et al. 2011). Though tiny, coccolithophores are numerous enough for this to matter, with blooms of the cosmopolitan species Emiliania huxleyi exceeding 250,000 km2. When these cells die and release their coccoliths, the remains of these blooms can be seen from space (Holligan et al. 1993; Balch et al. 1996; Tyrrell and Merico 2004). Because reduced calcification is thought to affect fitness in calcifying coccolithophores (Beaufort et al. 2011), there has been particular interest in the possibility that adaptive evolution may mitigate the reduction in calcification as oceans acidify. There is evidence that this can sometimes occur, since well-calcified morphotypes of coccolithophores have been found in low pH regions of the ocean, despite a general trend of decreasing calcification with rising pCO2 levels, though part of this indicates species succession rather than evolution within species (Beaufort et al. 2011).

STUDY AREA AND METHODOLOGY

STUDY AREA;

The present study was carried out in the Fishing Harbour of Visakhapatnam for the collection of plankton organisms. Fishing harbour located on the city's east coast is one of the India's largest fishing harbour offering a spectacular view of Bay of Bengal. The fishing harbour spread over an area of 26 hectares and it was established in the year 1976 and is managed by the Visakhapatnam port trust. Its capacity is 700 mechanised boats and 300 beach landing crafts. Visakhapatnam port consists of three harbours - outer harbour, inner harbour and the fishing harbour. The outer harbour has 6 berths and it capable for handling vessels with a draft upto 17 meters and the smaller inner harbour has 18 berths those are paramax compatible. The dolphins nose hill to the north of the entrance channel protects the harbour from cyclones that can strike the east coast.

Fishing harbour has easy access for the public as it has big market area for commercial purpose of exports and other marketing needs. There are many fishing crafts placed in jetties for active fishing purposes. During the study Jetty 6 was taken for sample collection as this jetty is free from the market area of the harbour and the fishing vessel matsya shikari of FSI berths at this jetty. The crew of the vessel are supportive during the sample collection and the water is undisturbed in this region.

PLATE 1: Fig a) The google map showing fishing harbour area

Fog)

METHODOLOGY

During the study the surface water samples are collected from the fishing harbour area entrance channel of Visakhapatnam harbour. A plastic bucket was tied with roap and bucket full of water is collected during morning hours of day for a period of 10 days (every 24 hours same). The samples were bought to the laboratory for analysis and identification. 1 litre of sample is poured in 1000 ml measuring cylinder for quantitative observation of plankton. Another 1litre is filtered through whatman filter paper GF/C using suction apparatus. Top 100ml of filtrate is collected in beaker for quanlitative observation of species composition and identification. The filtered water sample is observed under the microscope by taking a drop of the sample on a glass slide while observing the species we used 10x20x40 magnified lens (Labomed 5100 model). The samples are stained with vital stains such as methyl green ,neutral red and lugol's solution. For quantitative analysis 1000ml of water was taken in cylinder measuring jar to which 10 ml of lugol's iodide is added. This helped in fixing of plankton. After 48 hours supernatant water sample is pippeted out and left over 100ml is preserved in sample bottle. The preserved sample is to observing the species composition in a counting chamber sedjewick rafter counter for enumeration. By following above methods the quantitative & qualitative analysis samples are carried out.

RESULTS

The present study undertaken in fishing harbour area for a period of 2 weeks to understand species composition and distribution of plankton communities.The observation revealed 3 major groups of planktons.

1.Phytoplankton

2.Protozooplankton

3.Metazooplankton

Total of 18 species of phytoplankton, 13 species of protozooplankton and 4 species of metazooplankton identified from the sample.

Table 1: Plankton community composition in fishing harbour during short term study:

S.no	**Plankton communities**	**Number of species**
1.	Phytoplankton	18
2.	Flagellates	4
3.	Ciliates	9
4.	Copepods	4

Table 2: Phytoplankton occurance at 24 hr intervals during the study at fishing harbour.

S no	Name	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1.	*Navicula sp*	+	+	+	+	+	+	+
2.	*Skeletonema sp*	+	+	-	+	-	+	+
3.	*Pleurosigma sp*	+	+	+	+	+	+	+

4	*Chaetoceros sp.*	+	+	+	+	+	+	+
5	*Nitschizia longissima sp*	-	-	+	+	-	+	+
6	*Thalassiosera pseudonana*	-	-	-	-	+	+	+
7	*Dytillum sp*	-	-	-	-	-	+	+
8	*Cymbella sp*	-	-	-	_-	-	+	+
9	*Blue green algae*	-	-	+	+	-	+	+
10	*Oscillatoria sp*	-	-	-	+	+	+	+

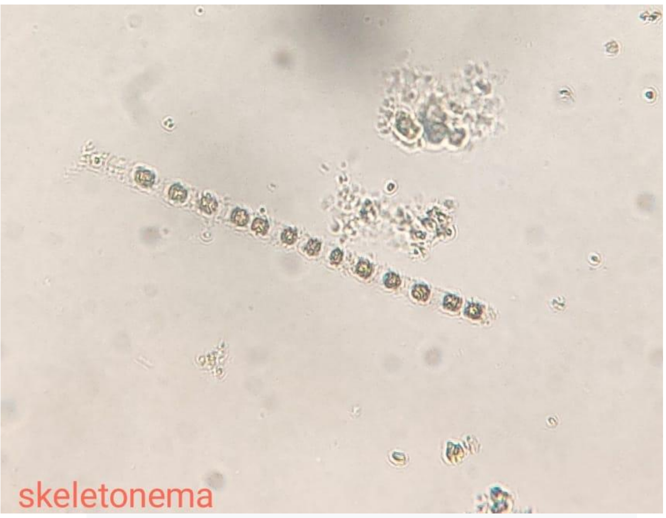
1. Navicula sp.

Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Stramenopiles
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Bacillariophyceae
Order:	Naviculales
Family:	Naviculaceae
Genus:	*Navicula* Bory de Saint-Vincent, 1822

DESCRIPTION OF GENERA;

Navicula is a genus of boat-shaped diatom algae, comprising over 1,200 species. *Navicula* is Latin for small ship and also a term in English for a boat-shaped incense-holder. Diatoms are eukaryotic, primarily aquatic, single-celled photosynthetic organisms play an important role in global ecology, producing about a quarter of all the oxygen within Earth's biosphere, often serving as foundational organisms, or keystone species in the food chain of many environments where they provide a staple for the diets of many aquatic species. *Navicula* diatoms have been observed to possess a motile ability to glide over one another and on hard surfaces such as microscope slides. Around the outside of the navicula's shell is a girdle of mucilage strands that can flow and thus act as a tank track.

2. Skeletonema sp



Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Stramenopiles

Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Bacillariophyceae
Order:	Thalassiosirales
Family:	Skeletonemataceae
Genus:	*Skeletonema* R. K. Greville, 1865

DESCRIPTION OF GENERA;

Skeletonema is a genus of diatoms in the family Skeletonemataceae. It is the type genus of its family. The genus *Skeletonema* was established by R. K. Greville in 1865 for a single species, *S. barbadense*, found in the Barbados deposit [Jung 2009]. These diatoms are photosynthetic organisms, meaning they obtain carbon dioxide from their surrounding environment and produce oxygen along with other by products. Reproduce sexually (sexual reproduction is oogamous) and asexually [Guiry 2011]. *Skeletonema* sp. belong to the morphological category referred to as centric diatoms. These are classified by having valves with radial symmetry and the cells lack significant motility [Horner 2002]. *Skeletonema* are cylindrical shaped with a silica frustule. Cells are joined by long marginal processes to form a filament [Horner 2002]. Their length ranges from 2-61 micrometers, with a diameter ranging from 2-21 micrometers [Hasle 1997].

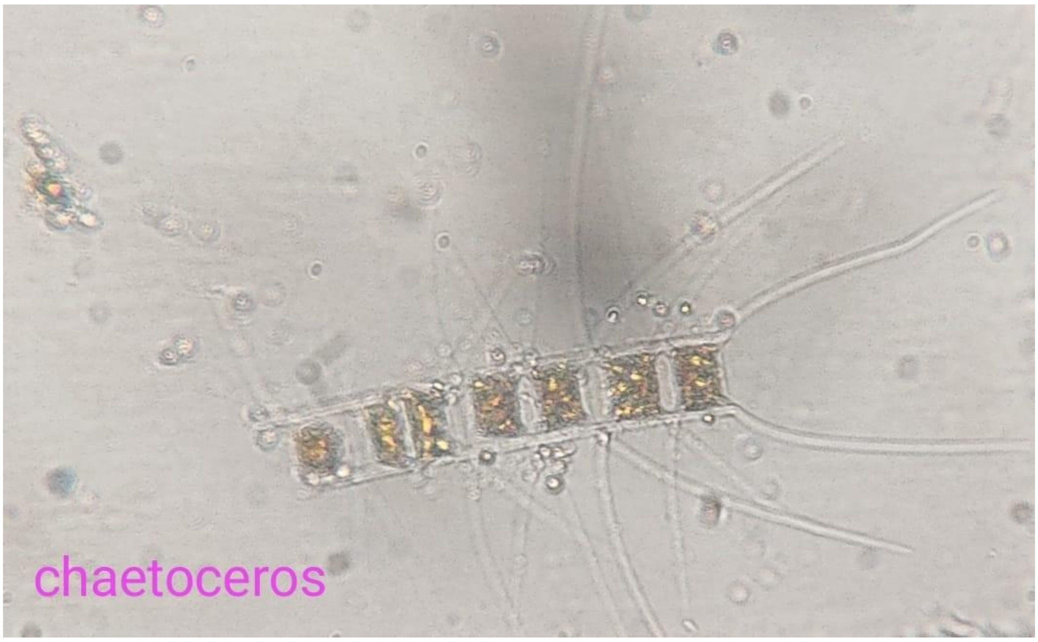
3. PLEUROSIGMA

Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Stramenopiles
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Bacillariophyceae
Order:	Naviculales
Family:	Pleurosigmataceae
Genus:	*Gyrosigma* A.H.Hassall, 1845

DESCRIPTION OF GENERA;

The genus of marine planktonic organisms known as *Pleurosigma* is named so for its shape. *Sigma* is a latin root used in reference to the shape of the organism. It has also been related to the orbital movement of electrons around an internuclear axis, which is similar to the orbital movement the Pleurosigma diatom makes around one of its tips during movement.The genus employs a pulsating of the body to induce gliding movement as well as occasional circular rotations around one end of the organism to change course.

4. Chaetoceros sp.



Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Stramenopiles
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Bacillariophyceae
Order:	*incertaesedis*
Family:	Chaetocerotaceae
Genus:	*Chaetoceros* Ehrenberg (1844)

DESCRIPTION OF GENERA;

Chaetoceros consists of cells linked together, forming long chains. Individual cells are elliptical to circular in valve view, making them centric diatoms, and are rectangular in girdle view. Like other diatoms, cells of *Chaetoceros* are surrounded by siliceous cell walls known as frustules. Each frustule has four hollow processes called setae, or spines, that allow adjacent cells to link together and form colonies. Colonies can form chains that are coiled, straight, or curved. Cell size can range from <10 um to 50 um. Some species of *Chaetoceros* produce resting spores that are highly tolerant to adverse conditions.

5. *Nitschzia longissima*

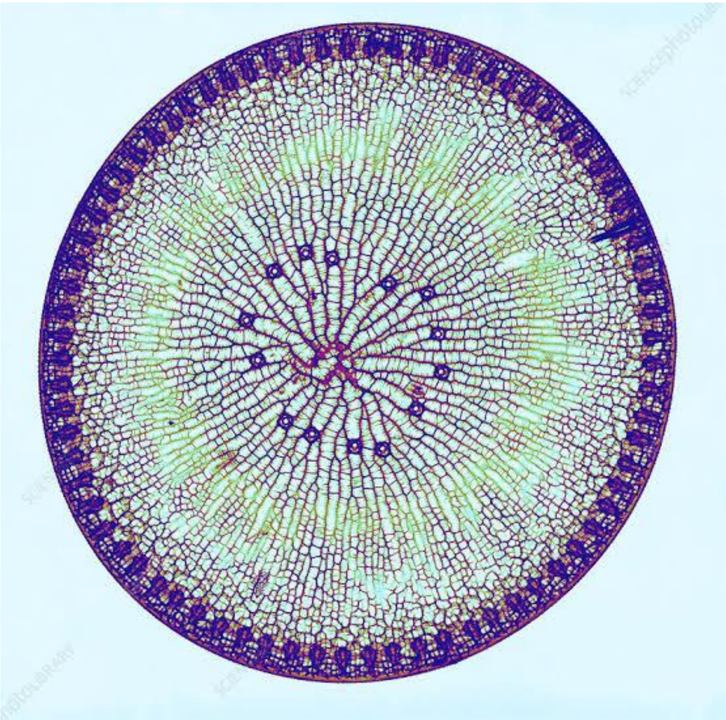
Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Stramenopiles
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Bacillariophyceae
Order:	Bacillariales
Family:	Bacillariaceae

DESCRIPTION OF GENERA;

Nitzschia sp. is a common pennate marine diatom. In the scientific literature, this genus, named after Christian Ludwig Nitzsch, is sometimes referred to incorrectly as **Nitzchia**, and it has many species described, which all have a similar morphology. .

In its current circumscription, Nitzschi*a* is paraphyletic. Nitzschia is found mostly in colder waters, and is associated with both Arctic and Antarctic polar sea ice, where it is often found to be the dominant diatom. *Nitzschia* includes several species of diatoms known to produce the neurotoxin known as domoic acid, a toxin responsible for the human illness called amnesic shellfish poisoning. The species N. frigid*a* is found to grow exponentially even at temperatures between −4 and −6 °C.

6. *Thalassiosira pseudonana*



Superphylum:	Heterokonta
Class:	Coscinodiscophyceae
Order:	Thalassiosirales
Family:	Thalassiosiraceae
Genus:	*Thalassiosira*
Species:	***T. pseudonana***

DESCRIPTION OF GENERA;

Thalassiosira pseudonana is a species of marine centric diatoms. It was chosen as the first eukaryotic marine phytoplankton for whole genome sequencing. T. pseudonana was selected for this study because it is a model for diatom physiology studies, belongs to a genus widely distributed throughout the world's oceans, and has a relatively small genome at 34 mega base pairs. Scientists are researching on diatom light absorption, using the marine diatom of Thalassiosira. The diatom requires a high enough concentration of CO_2 in order to utilize C_4 metabolism (Clement *et al.* 2015).

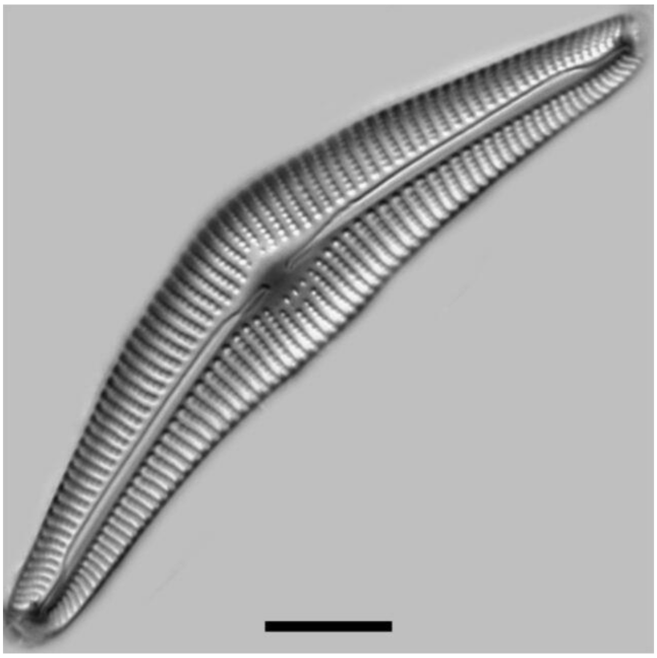
7. *Dityllum brightwellii*

Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Stramenopiles
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Bacillariophyceae
Order:	Lithodesmiales
Family:	Lithodesmiaceae
Genus:	*Ditylum*
Species:	***D. brightwellii***

DESCRIPTION OF GENERA;

Ditylum brightwellii is a species of cosmopolitan marine centric diatoms. It is a unicellular photosynthetic autotroph that has the ability to divide rapidly and contribute to spring phytoplankton blooms. The D. brightwellii cell has a high length to diameter ratio. The cell wall is silicified, as is characteristic of all diatoms. This hard, porous covering is known as the frustule and causes the cell to be more dense than the surrounding water. Oceanic currents and surface winds prevent D. brightwellii cells from sinking beneath the euphotic zone. Cells range in size from 25-100µm in diameter and 80-130µm in length. The valve is most often triangular in shape, but can also be biangular or quadrangular. A long hollow tube called the rimoportula is located centrally and extends from each valve.

8. CYMBELLA



Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Stramenopiles
Phylum:	Gyrista
Subphylum:	Ochrophytina
Class:	Bacillariophyceae
Order:	Cymbellales
Family:	Cymbellaceae
Genus:	*Cymbella* C.Agardh, 183

DESCRIPTION OF GENERA;

Cymbella is a diatom genus in the family cymbellaceae including over 800 species. Valves slightly to strongly asymmetric to the apical axis. Distal raphe ends deflected dorsally. Apical porefields present. Stigmata if present located on the ventral side. Chloroplast usually a single double H with a central pyrenoid, pyrenoid lying on the dorsal side of the girdle. Cymbella lanceolata has a single chloroplast with a central pyrenoid and many lobes coming off in different directions.

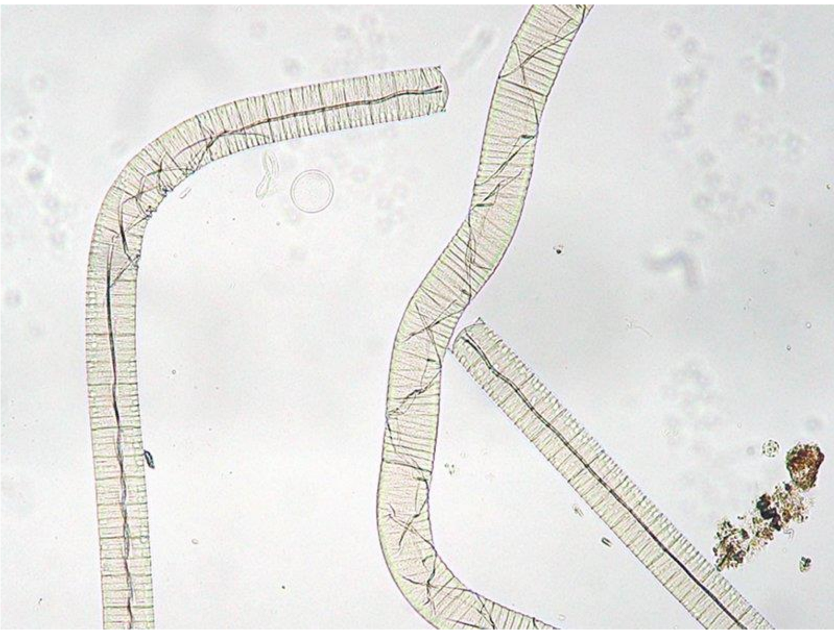
9. BLUE GREEN ALGAE FILAMENTS

Domain:	Bacteria
Clade:	Terrabacteria
(unranked):	Cyanobacteria-Melainabacteria group
Phylum:	Cyanobacteria Stanier, 1973
Class:	Cyanophyceae

DESCRIPTION OF GENERA;

C**yanobacteria** also called **Cyanophyta**, are a phylum of gram-negative bacteria[4] that obtain energy via photosynthesis. The name *cyanobacteria* refers to their color . which similarly forms the basis of cyanobacteria's common name, **blue-green algae**, although they are not usually scientifically classified as algae. They appear to have originated in a freshwater or terrestrial environment. Sericytochromatia, the proposed name of the paraphyletic and most basal group, is the ancestor of both the non-photosynthetic group Melainabacteria and the photosynthetic cyanobacteria, also called Oxyphotobacteria.yanobacteria use photosynthetic pigments, such as carotenoids, phycobilins, and various forms of chlorophyll, which absorb energy from light. Unlike heterotrophic prokaryotes, cyanobacteria have internal membranes. These are flattened sacs called thylakoids where photosynthesis is performed.

10.OSCILLATORIA SPECIES



Domain:	Bacteria
Phylum:	Cyanobacteria
Class:	Cyanophyceae
Order:	Oscillatoriales
Family:	Oscillatoriaceae
Genus:	*Oscillatoria* Vaucher *ex* Gomont, 1822

DESCRIPTION OF GENERA;

Oscillatoria is a genus of filamentous cyanobacterium which is often found in freshwater environments, such as hot springs, and appears blue-green.[1] Its name refers to the oscillating motion of its filaments as they slide against each other to position the colony facing a light source.[2] *Oscillatoria* reproduces by fragmentation, facilitated by dead cells which separate a filament into separate sections, or hormogonia, which then grow.[1] *Oscillatoria* uses photosynthesis to survive and reproduce. Each filament of oscillatoria consists of trichome[*clarification needed*] which is made up of rows of cells. The tip of the trichome oscillates like a pendulum. In reproduction, it takes place by vegetative means only. Usually the filament breaks into a number of fragments called hormogonia. Each hormogonium consist of one or more cells and grow into a filament by cell division in one direction.

CILIATES

1. STROMBIDIUM

Domain:	Eukaryota
(unranked):	Sar
(unranked):	Alveolata
Phylum:	Ciliophora
Class:	Spirotrichea
Subclass:	Oligotrichia
Order:	Oligotrichida
Family:	Strombidiidae
Genus:	*Strombidium*
Species:	***S. lagenula***

DESCRIPTION OF GENERA;

Strombidiumlagenula is a species of marine planktonic ciliates belonging to the genus *Strombidium* (which contains about 31 species) in the order Oligotrichida. Like other ciliates, they are unicellular eukaryotes (protists) that move using cilia. However in *Strombidiumlagenula* and oligotrichs in general, the cilia on the cell body have been either lost or heavily reduced to "bristles", while the cilia surrounding the oral opening form large and prominent structures called membranelles, which are also used for locomotion.

2.EUPLOTES

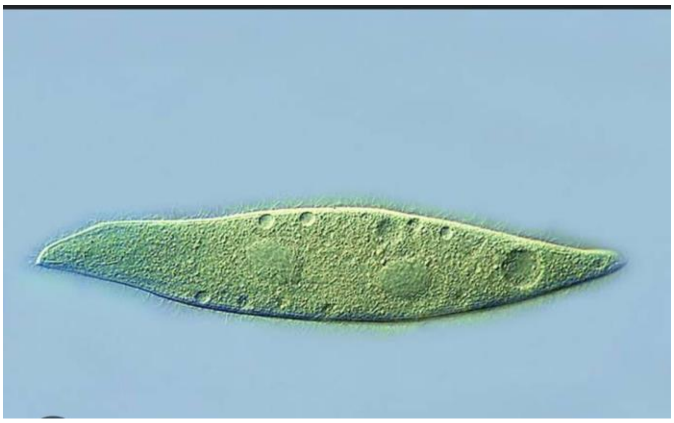
Domain:	Eukaryota
(unranked):	SAR
(unranked):	Alveolata
Phylum:	Ciliophora
Class:	Spirotrichea
Subclass:	Euplotia
Order:	Euplotida

Suborder:	Euplotina
Family:	Euplotidae
Genus:	*Euplotes* Ehrenberg, 1830

DESCRIPTION OF GENERA;

Euplotes cells are inflexible, dorsoventrally flattened, and roughly ovoid, with a very large oral region (peristome) bordered on the left by a long "adoral zone of membranelles" (AZM). Like other spirotrich ciliates, *Euplotes* move and feed with the help of compound ciliary organelles called "cirri," made up of thick tufts of cilia sparsely distributed on the cell. Strong cirri on the ventral surface of the cell enable *Euplotes* to walk or crawl on submerged detritus and vegetation. All species of *Euplotes* have a group of stiff bristles (caudal cirri), which protrude from the posterior of the cell.

3.AMPHILECTUS

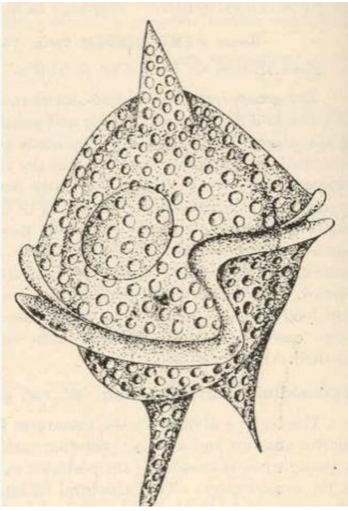


Kingdom:	Animalia
Phylum:	Porifera
Class:	Demospongiae
Order:	Poecilosclerida
Family:	Esperiopsidae
Genus:	*Amphilectus* Vosmaer, 1880[1]

DESCRIPTION OF GENERA;

Body laterally compressed, highly elongate with anterior neck-like region which bends towards the dorsal edge. Oral aperture a slit on convex edge of neck region, extends less than halfway down the body. Ciliation present on both lateral surface although there is a tendency to some reduction on the left surface resulting in it being difficult to distinguish. Ciliation on right surface is extensive and forms longitudinal rows which converge on each other in the anterior region. There is a distinctive area of cilia along the oral slit forming a mane-like brush. Trichocysts commonly present particularly in neck.

4.PERIDINIUM



Domain:	Eukaryota
Clade:	Diaphoretickes
Clade:	SAR
Clade:	Alveolata
Phylum:	Myzozoa
Superclass:	Dinoflagellata
Class:	Dinophyceae
Order:	Peridiniales
Family:	Peridiniaceae
Genus:	*Peridinium* Ehrenberg

DESCRIPTION OF GENERA;

Peridinium is a genus of motile, marine and freshwater dinoflagellates. Their morphology is considered typical of the armoured dinoflagellates, and their form is commonly used in diagrams of a dinoflagellate'sstructure. *Peridinium* can range from 30 to 70 µm in diameter, and has very thick thecal plates.

CONCLUSION

The short term study on Plankton communities revealed interesting observations in the fishing harbour of Visakhapatnam. Plankton communities are very important in establishing the productivity of ecosystem. The marine phytoplankton act as producers of marine ecosystem. The fauna of marine ecosystem depend on phytoplankton productivity During the study results showed ;

18 phytoplanktons,9 protozooplankton,4 copepodes respectively. The phytoplankton are the primary producers and zooplankton act as primary consumers of marine ecosystem.

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