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Checklist of diatoms species available along the Narara and Poshitra Island, Marine National Park, Jamnagar, Gujarat

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Abstract

The present study on biological diversity of marine diatoms along the Narara and Poshitra Island, Marine National Park, Jamnagar, Gujarat. Study was conducted from August 2015 to February 2017. During present study 132 spp. of Diatoms were observed. Among them *Coscinodiscus asteromphais*, *C. subtilis*, *C. oculus iridis*, *Odontella mobiliensis*, *O. rhombus*, *Melosira moniliformis*, *Grammatophora marina*, *Thalassiothrix frauenfeld*, *Rhabdomyoma sp.*, *Navicula longa*, *Navicula sp.*, *Nitzschia lanceolata*, *N. seriata*, *Licmophora abbreviata*, *Pleurosigma aestuarii* and *P. normanii* were the dominant diatom species throughout the study. The coast of Poshitra and Narara was extensively surveyed to get an idea of the characteristic of coast, and distribution pattern of the diversity.

Keywords: checklist, diatoms, diversity, narara, poshitra, island

1. Introduction

The ocean is the largest and the most stable of all biomes which covers about 70% of the earth's surface. The pelagic environment of the ocean supports two basic types of marine organisms. The word plankton has come from the Greek word "planktons", meaning that which is passively drifting or wandering. Depending upon whether a planktonic organism is a plant or animal, a distinction is made between phytoplankton and zooplankton. Phytoplankton are completely passive, some of them are capable of swimming. Phytoplankton are free floating tiny floral components that are widely distributed in the marine and estuarine environments.

The important groups of phytoplankton are diatoms (Bacillariophyceae), dinoflagellates (Dinophyceae), blue-green algae (Cyanophyceae), green algae (Chlorophyceae), phytoflagellates (Xanthophyceae, Chrysophyceae, Haptophyceae, Cryptophyceae) and nanophytoplanktons (Chlorella, Nannochloropsis, etc.). In addition to these, two other classes namely Silicoflagellates and Coccolithophores also belong to the category of phytoplankton. Phytoplankton communities in marine environments usually include several taxonomic groups, and these contribute to primary production and interaction between trophic levels (Roy *et al.*, 2006) [1].

Diatoms constitute the major part of the phytoplankton found in seawater. They are important because they serve as the first vital link in the food chain, either directly or indirectly, of most every animal. Probably at least at some stage of their life history, all fish, molluscs and crustaceans are diatom feeders. They are broadly divided into two major divisions: the centrales or centricae and the pennales or pennate, depending on the structure and sculpture on their cell walls. Fragments of diatoms, primarily of *Coscinodiscus sp.* have found as food items in the gut contents of *Acetes sp.* (Metillo, 2002) [2]. The micronectonic sergestid shrimps of the genus *Acetes* are known to be selective omnivores upon phytoplankton and zooplankton (Xiao and Greenwood, 1993; Mcleay and Alexander, 1998) [3, 4].

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Table 1: Differences between centric and pennate diatoms (Abhijit *et al.*, (2006) ^[5] Introduction to Marine Phytoplankton)

Point	Centric Diatoms	Pennate diatoms
Cell Shape	Discoid, Solenoid or cylindrical.	Elongated and fusiform, Oval, sigmoid or roughly circular.
Ornamentation	Radial in nature i.e., the arrangement of marking is radiating from the Centre.	Bilateral in nature i.e., the arrangement of the marking is on either side of the apical (main) axis.

2. Material and Methods

2.1 Study sites

Marine National Park is a suitable place for biodiversity conservation. Marine National Park (Gulf of Kutch) is situated on the Southern coast of the Gulf of Kachchh in the Jamnagar district of the state of Gujarat. Marine National Park is the first National Marine Park of India. In 1980, an area of 270 km² from Okha to Jodiya was declared Marine Sanctuary. Later, in 1982, a core area of 110 km² was declared Marine National Park under the provisions of the Wildlife (protection) Act, 1972 of India. The present study was conducted at two places of Gulf of Kutch, *i.e.* Poshitra (22° 28' N and 69° 57' E) and Narara Island (22°23' N and 69° 10' E), which is situated in the Western coast of Gujarat, India during August 2015 to February 2017. (Fig.1).

2.2 Sampling procedure and laboratory analysis

2.2.1 Sampling methods

During the field samples collection, 100 liters of surface seawater was filtered two times during low tide and high tide both by phytoplankton net of > 20µm, 37 µ, 53 µ, 125 µ, 250

µ different mesh size used. Two number of each samples were collected, one for qualitative and quantitative studies, preserved with 5% formalin. The live samples were kept in a cool pack containing ice, below 2° C even in summer, for maintaining the physiological activity of the phytoplankton samples low. The collected samples were preserved in 1% Lugols Iodine solution within 5 min. (2-3 drops) of collection in order to avoid damage by bacterial action and autolysis (Chandy *et al.*, 1991; Redekar and Wagh, 2000; Harnstrom *et al.*, 2009; Manna *et al.*, 2010; Baytut *et al.*, 2010) ^[6, 9, 7, 8, 10].

2.2.2 Laboratory Analysis

The qualitative analysis of diatoms was done by using a Sedgwick-Rafter counting chamber under Stereo Zoom Microscope (Model no.: DCM 130; USB 2.0; Resolution 1.3 Mega pixels). The identification and confirmation of the taxonomic status of the diatoms was done up to possible taxonomic level (genus/species) by referencing relevant literature (Smith, 1977; Isamu, 1979; Santhanam *et al.*, 1987) ^[11, 12, 13].



Fig 1: Study location- Gulf of Kutch, *i.e.* Poshitra (22° 28' N and 69° 57' E) and Narara Island (22°23' N and 69° 10' E)

3. Results and discussion

3.1 Diatoms species composition and abundant species

In present investigations total 132 species of diatoms were recorded in both sites. The present study was conducted at two places of Gulf of Kutch, *i.e.* Poshitra and Narara Island which is situated in the Western coast of Gujarat, India. Majority of the species found are diatoms of which, Centric diatom. A diatom (Bacillariophyta) that has radial symmetry. Most centric diatoms are marine. Compare to pennate diatoms. Diatoms are divided in to two parts: 1. centric diatoms and 2. Pennate diatoms. 83 species of centric diatoms were recorded in both sites.

Diatom frustules are characteristically highly ornamented, forming an amazing range of forms. The shape of the diatom frustule is species specific. In other words, the evolutionary relationships of diatoms and their names (diatom taxonomy) have been based on the silica frustule, at least until recently (although there are exceptions). The centric diatoms are not able to move, but some pennate diatoms may move across surfaces or up and down within sediments. 49 species of

pennate diatoms recorded during present study.

Saravanakumar *et al.*, (2008) ^[14] identified Diatoms dominated than other phytoplankton species at this study site. The total number of phytoplankton collected and the number of diatoms observed were very high during the present study at both locations. This suggests better water quality and higher species diversity at West coast, Gujarat. Saravanakumar *et al.*, (2008) ^[14] identified 104 species of phytoplankton constituting 82 species of diatoms, 16 species of dinoflagellates, 3 species of blue green algae and 2 species of green algae along Gulf of Kachchh. Phytoplankton composition and density varied from coast to coast, sea to sea, season to season, and year to year (Prabhakar *et al.*, 2011) ^[15]. Ramamurthy and Dhawan, 1963 ^[16] observed that 104 species of phytoplankton constituting 82 species of diatoms, 16 species of dinoflagellates, 3 species of blue green algae and 2 species of green algae along Gulf of Kachchh. Gopalakrishnan (1971) reported 57 species of diatoms in Okha port, Gujarat while Bhaskaran and Gopalakrishnan (1972) recorded blooms of *Chaetoceros* in the same area

along Vizhinjam coast. Mathew (1980) recorded 89 species of diatoms along the Konkan coast. In the Gulf of Mannar, abundance of *Chaetoceros*, *Pleurosigma* and *Biddulphia* was recorded by Sarvanakumar *et al.* (2008) [14]. Their observations revealed that along both the coasts of India, the predominance of species belonged to genera *Chaetoceros*, *Cosinodiscus*, *Pleurosigma*, *Navicula*, *Thalassiosira*, *Nitzschia* and *Rhizosolenia*.

Pradhahar *et al.* (2011) [15] reported dominance of diatoms among all the groups contributing to the total phytoplankton production in Kadalur coastal zone, Tamilnadu. Karolina *et al.* (2009) [20] reported 57 genera of phytoplankton with domination by *Cosinodiscus*, *Rhizosolenia*, *Biddulphia* and *Mellosira* in the Dahana creek, west coast of India. Although all the forms listed above were common in the present study however as observed by few authors in the coastal waters of West coast of India, the species belonging to *Biddulphia*, *Cosinodiscus*, *Ditylum*, *Chaetoceros*, *Planktoniella*, *Pleurosigma* and *Rhizosolenia* were common in the present study.

3.2 Centric Diatoms

Arachnoidiscus ornatus, *Odontella sp.*, *O. aurita*, *O. granulata*, *O. mobiliensis*, *O. obtusa*, *O. pulchella*, *O. rhombus*, *O. sinensis*, *Bacteriastrum hyalinum*, *B. varians*, *Cheatocheros sp.*, *C. affinis*, *C. brevis*, *C. curvisetus*, *C. decipiens*, *C. decipiens forma singularis*, *C. didymus var anglica*, *C. diversus*, *C. laevis*, *C. lorenzianus*, *C. pendulus*, *C. peruvianus*, *C. subsecundus*, *Coscinodiscus sp.*, *C. anguste-lineatus*, *C. asteromphais*, *C. excentricus*, *C. nitidus*, *C. nudulifer*, *C. oculus iridis*, *C. subtilis*, *Climacodium frauenfeldianum*, *Ditylum sp.*, *D. brightwellii*, *D. sol*, *Eucampia sp.*, *Gossleriella tropica*, *Guinardia sp.*, *Hemiaulus sp.*, *Hyalodiscus stelliger*, *Lauderia borealis*, *Leptocylindrus danicus*, *Melosira sp.*, *M. juergensi*, *M. molyneiformis*, *M. nummuloides*, *Planktoniella sol*, *Podosira sp.*, *Rhizosolenia alata*, *R. alata forma indica*, *R. crassispina*, *R. delicatula*, *R. hebatata var semispina*, *R. setigera*, *R. stolterforthii*, *Skeletonema coastatum*, *Stephanopyrix nipponica*, *S. palmeriana*, *Streptotheca thamensis*, *Thalassiosira sp.*, *T. condensate*, *T. hyaline*, *T. subtilis*, *Triceratium sp. 1*, *Triceratium sp. 2*, *T. arcticum*, *T. favus*, *T. impar* and *T. reticulum*.

3.3 Pennate Diatoms

Amphora sp., *A. coastata*, *A. lineolata*, *Amphipora sp.*, *A. gigantia*, *Achnanthes sp.*, *Asterionella japonica*, *Bacillaria paradoxa*, *Campyloneis sp.*, *Campylodiscus sp.*, *Campylosira sp.*, *Cocconeis sp.*, *C. placentula*, *Climacosphenia sp.*, *C. moniligera*, *Cymbella sp.*, *C. marina*, *Diploneis sp.*, *D. Fusca*, *D. fusca var pelagica*, *D. splendida*, *Gyrosigma accuminatum*, *G. fasciola*, *G. spencerii*, *Grammatophora marina*, *Licmophora abbreviata*, *L. flabellata*, *Nitzschia sp.*, *N. coasterium*, *N. frigida*, *N. lanceolata*, *N. longissima*, *N. pungens*, *N. seriata*, *N. sigma*, *N. sigma var intermedia*, *N. striata*, *N. vietra*, *Navicula sp. 1*, *Navicula sp. 2*, *Navicula sp. 3*, *Navicula sp. 4*, *N. longa*, *Pleurosigma sp. 1*, *Pleurosigma sp. 2*, *P. aestuarii*, *P. affine*, *P. angulatum*, *P. elongatum*, *P. galapagense*, *P. normanii*, *P. rectum*, *P. rigidum*, *Pseudonitzschia sp.*, *Rhabdomyoma sp.*, *R. adriaticum*, *R. punctatum*, *Striatella unipunctata*, *Surirella sp.*, *Synedra formosa*, *Thalassionema nitzschiioides*, *Thalassiothrix frauenfeldii* and *T. longissima*.

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