

## First record of fourteen phytoplankton species off Rushikulya estuary, Northwestern Bay of Bengal

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Fourteen numbers of phytoplankton species have been reported for the first time in coastal waters off Rushikulya estuary.

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### Introduction

Phytoplankton, the free-floating microscopic algae live in the pelagic area of the ocean. They are the key primary producers of the ocean and responsible for 40 to 50% of the total oxygen production on earth<sup>1,2,3</sup>. Phytoplankton serves as excellent indicators of ecological change in the aquatic environment. In the recent years the scientific world keeps an attention on phytoplankton dynamics due to their diverse biogeochemical functions in the ocean. Composition and distribution of phytoplankton vary according to environmental fluctuations. Non-native species can reproduce in large numbers and rapidly expand their ranges which may cause significant adverse impact on existing native biodiversity and water quality<sup>4,5</sup>. The present study area is ecologically sensitive due to congregation of Olive Ridley sea turtles for mass nesting. It is therefore we feel essential to monitor the phytoplankton floral spectrum with regard to prevailing environmental conditions. To accomplish this, continuous monitoring of phytoplankton on monthly interval was carried out from March, 2010 to February, 2012 under SATellite Coastal and Oceanographic REsearch (SATCORE) programme coordinated by Indian National Centre for Ocean Information Services (INCOIS), Ministry of Earth Sciences, Hyderabad. In the present study, there are 14 numbers of phytoplankton species have been reported for the first time in coastal waters off Rushikulya estuary (Fig. 1). The study area is influenced by freshwater flow via Rushikulya estuary.

The area enjoys international recognition as Rushikulya rookery for mass nesting of *Olive Ridley* sea turtles. Coastal water of this area receives high quantity of dissolved chemicals from several sources<sup>6</sup>. Large scale erosion, river mouth shift and dredging activity of adjacent Gopalpur port alter the geomorphology and sediment pattern of the area.

### Materials and Methods

During the survey, phytoplankton samples were collected from the surface water by using clean plastic

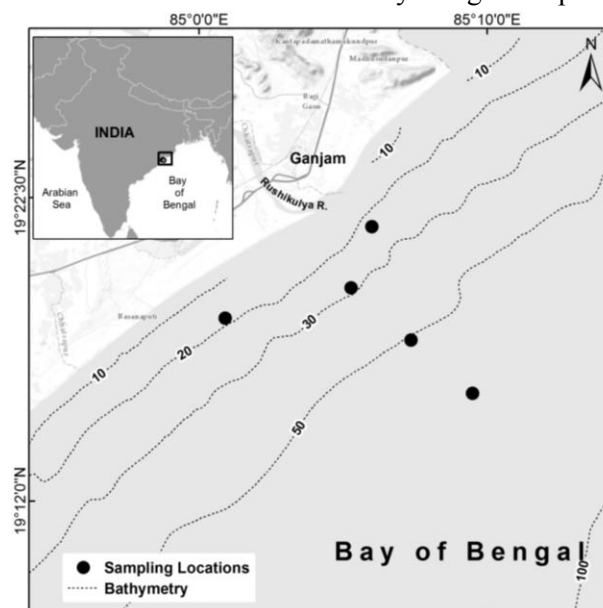


Fig. 1—Map showing sampling locations (in black dots) in the study area

bucket. 1000 ml of surface water sample was fixed with 1% Lugol's iodine solution and then preserved with 3% neutralized formaldehyde solution. The phytoplankton species were identified following the standard literature<sup>7-10</sup>. After completing qualitative analysis and thorough survey of previous literatures, 14 number of phytoplankton species were found unreported from this area<sup>11-34</sup>.

The newly recorded species are *Meuniera membranacea*, *Hemiaulus sinensis*, *Hemiaulus hauckii*, *Coscinodiscus wailesii*, *Chaetoceros messanensis*, *Bellerochea malleus*, *Cerataulina pelagica*, *Pyrophacus horologicum*, *Ornithocercus steinii*, *Ceratium macroceros*, *Ceratium azoricum*, *Euglena acus*, *Pediastrum boryanum*, *Dinobryon sertularia* (Fig. 2).

## Results and discussion

A total of 14 species of phytoplankton comprising 7 species of diatoms, 4 species of dinoflagellates, 1 species of green algae, 1 species of euglenoids and 1 species of silicoflagellates were reported newly in the shallow coastal water off Rushikulya estuary.

The species belonging to green algae (*Pediastrum boryanum*), euglenoids (*Euglena acus*) and silicoflagellates (*Dinobryon sertularia*) were observed only during the monsoon period. Among the 7 newly reported species of diatoms, *Hemiaulus sinensis*, *Hemiaulus hauckii*, *Coscinodiscus wailesii*, *Chaetoceros messanensis*, *Bellerochea malleus*, *Cerataulina pelagica* were belonging to group centrales whereas *Meuniera membranacea* to pennates. *Cerataulina pelagica*, one of the newly reported species is cosmopolitan in coastal regions, concentrating in temperate to warm waters<sup>35</sup>. These species can cause mechanical irritation in fish gills resulting mortalities<sup>36</sup>. *Cerataulina pelagica* can also negatively affect copepod reproduction<sup>37</sup>. Blooms of *Cerataulina pelagica* reported sometimes with depletion of nutrients following previous diatom blooms. *Coscinodiscus wailesii* is primarily a neritic species, but occasionally observed beyond the continental shelf and in estuaries. This species produces copious mucilage which can aggregate, sink and cover the seabed which affects the benthic habitat. This species is known for higher tolerance to heavy metals<sup>38</sup>. Recently Pednekar *et al.*<sup>39</sup> have reported *Coscinodiscus wailesii* as harmful algal species in the tropical estuarine waters of Goa.

Distribution of *Meuniera membranacea* is mostly limited to Gulf of Mexico, McDougall Sound, North Sea, Swedish Exclusive Economic Zone and United Kingdom Exclusive Economic Zone. From Indian water it was only recorded by Patil & Anil<sup>40</sup> and Harnstrom *et al.*<sup>41</sup> and limited to west coast of India.

*Bellerochea malleus* is regarded as a neritic plankton species from tropical and sub-tropical waters and well known from the North Sea, English Channel, New Zealand, Kuwait waters and Indian waters.

*Chaetoceros messanensis* is an oceanic species from subtropical to tropical waters<sup>42</sup> and it has occurred in warm water regions of North America<sup>43</sup> and Japan Sea<sup>44</sup>. Periodic blooms of the genus *Hemiaulus* occur in the central Pacific gyre and have been associated with the nitrogen-fixing *Rhizosolenia-Richelina* symbiosis<sup>45</sup>.

Among the dinoflagellates recorded during the study period, the genus *Ornithocercus* is not diverse as *Ceratium* and *Pyrophacus*. According to Gomez<sup>46</sup>, the genus *Ornithocercus* is represented only by 15 species in the entire world. *Ceratium* can cause red tide if conditions allow for excessive blooming.

## Conclusion

These species are reported for the first time from offshore region of Rushikulya estuary as well as Odisha coast. Occurrence of new species to coastal waters off Rushikulya estuary might be due to the change in ambient environment and marine invasion. Moreover the surveys carried out by previous workers were mostly limited to nearshore and estuarine zone. Hence our continuous study for two consecutive years on time series locations in different bathymetry extending from coastal to offshore region helped us to record the existence of the present reported species. Future studies are required on phytoplankton in this coastal water to trace out the persistence/removal of present reported species or invasion of other new species coupled with biogeochemistry of ambient medium. The present study will act as important information for the environmental planners / taxonomists for a sustainable coastal zone management.

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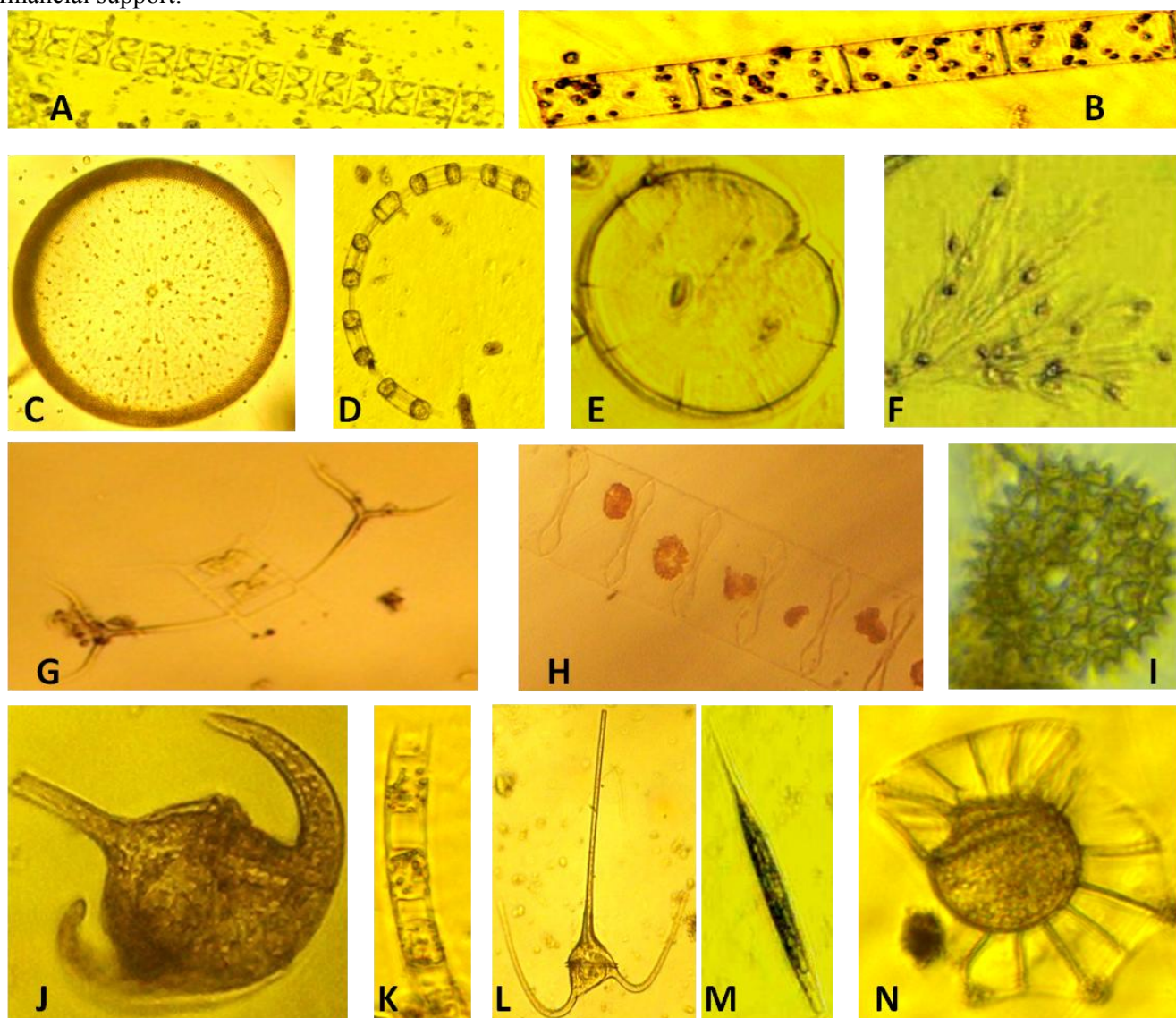


Fig. 2—Under-microscope photographs of newly reported phytoplankton species (A: *Meuniera membranacea* (100x), B: *Cerataulina pelagica* (100x), C: *Coscinodiscus walesii* (100x), D: *Hemiaulus sinensis* (100x), E: *Pyrophacus horologicum* (100x), F: *Dinobryon sertularia* (100x), G: *Chaetoceros messanensis* (200x), H: *Bellerochea malleus* (200x), I: *Pediastrum boryanum* (100x), J: *Ceratium azoricum* (200x), K: *Hemiaulus hauckii* (100x), L: *Ceratium macroceros* (100x), M: *Euglena acus* (100x), N: *Ornithocercus steinii* (100x)

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