Diatoms of Tropical Eutrophic Lagoon

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Abstract: The diatoms of Ologe lagoon for the first time were studied at monthly intervals for two years (February 2002-January 2004). A total of forty-eight species belonging to eighteen genera was found in diatoms, with pennate forms being more diverse and less abundance than the centric forms. *Aulacoseira granulata* , *A. granulata var.angustissima* , *A. granulata var. angustissima f.spiralis*, *A.granulata var. angustissima f. curvata), A. granulata var. muzzaensis* , *A. islandica* and *Cyclotella meneghiniana* were the more abundant and frequently occurring centric species throughout the study period. More frequently occurring pennate diatoms include: *Synedra ulna*, *Nitzschia closterium* , *Pinnularia major*, *Navicula oblonga* , *Cymbella minuta*, *Nitzschia palea* , *Surirella elegans* and *Gomphonema parvulum*. Rarely occurring diatoms at this station included *Biddulphia laevis* , *Melosira varians*, *Nitzschia accicularis*, *Pinnularia laevis*, *Cocconeis placentula* and *Eunotia gracilis* . In this study, six new diatoms species were recorded for Lagos lagoon complex. Community structure analysis shows a highly diverse environment.

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Keywords: diatom; Ologe lagoon; genera; Lagos lagoon complex; diverse environment

INTRODUCTION

Diatoms are valuable indicators of environmental conditions, since they respond directly and sensitively to many physical, chemical and biological changes that occur in the aquatic environment. Among unicellular microalgae, diatoms probably represent one of the most diverse groups, with a number of species estimated to be between 10000 and 100000 (Battarbee et al, 1999) hence, they constitute an ideal group to study its biodiversity. The diversity, abundance and distribution of phytoplankton within any lagoon have a direct correlation with the water quality and consequently the whole community structure. This is due to the fact that phytoplankton forms the base of any aquatic food chain and organic production in the lagoon and coastal ecosystem (Carson and Pan 1999). According to Van Den et al 1998, the composition of diatom communities reflects an entire complex of ecological parameters at a particular site. Lagoon and coastal ecosystems are the most productive zone of any marine environment due to the high anthropogenic inputs and shallowness of this zone which allows effective light penetration for photosynthesis by phytoplankton. The bulk of local fish production comes from the artisanal sector operating within this zone in Nigeria. Yet, the lagoonal environments are being highly influenced by ecological factors and human actions mainly from refuse and sewage dump, as well as agricultural wastes coming from river discharges and industrial effluents. The Nigerian coastal zone experiences a tropical climate consisting of rainy season (April to October) and dry season (November to March), it is low lying with heights of not more than 3.0 m above sea level and is generally covered by fresh water swamp, mangrove swamp, lagoonal mashes, tidal channels, beach ridges and sand bars. Lorghurst (1964) reported that the Nigerian coastal surface water is uniformly warm (about 28°C) and of low salinity (<32%). The vegetation is also characterized by Mangrove forests, brackish swamp forests and Rain forests. At present, there is no such checklist for Ologe lagoon diatoms hence this study lists diatoms species of this lagoon and also mentioned the species that is first record to Nigeria coastal waters.

DESCRIPTION OF STUDY AREA

Ologe lagoon (Fig. 1) is an expanse of shallow freshwater which extends between Lagos and Ogun States.). It is pressumbaly the smallest of the lagoons in South Western Nigeria with a surface area of 9.4km2, and lies at the distal end of Badagry creek between longitudes 6° 26'N to 6° 30'N and latitudes 3° 01'E to 3° 07'E. The main body of the lagoon lies within Badagry Local Government Area and it opens up to the Atlantic ocean via the Lagos Harbour and Dahomey in the Republic of Benin. The major

source of water are River Owo with a source in a town called Toto Owo where River Ore and Illo form a confluent with River Oponu in Ogun State (Akanni, 1992). Seventeen stations were chosen for sampling within the lagoon. The lagoon is shallow at most points and is open all year round via the Lagos habour to the sea (Hill and Webb, 1958; Sandison, 1966; Sandison and Hill, 1966). Like all parts of South-western Nigeria, the Ologe lagoon is exposed to two distinct seasons namely the wet (May – October) and the dry (November – April) (Nwankwo, 2004b). Like all parts of South-western Nigeria, the Ologe lagoon is exposed to two distinct seasons namely the wet (May – October) and the dry season (November – April) (Nwankwo, 2004b; Sandison and Hill, 1966). The harmmattan, a short season of dry, dusty North-East Trade winds experienced sometimes between November and January in the region reducing visibility and lowering assemblages is the common macrofloral assemblages especially in areas with reduced anthropogenic influence. The lagoon deposits are varied, and are reflected in the pattern and type of vegetation in the region. Most parts of the Ologe lagoon are colonized by recognizable riparian dense swamp rainforest community dominated by raphia palms especially Raphia hookeri, Elaeis guineensis, Acrotiscum aureum and Cocos nucifera (Nwankwo, et al 1999).Very few mangrove communities are recognizable around the Badagry creek end. Notable fauna of the area includes amphipods, Oligochaetes, few polychaetes, isopods, barnacles, oysters, periwinkle, nematodes, fiddler crabs, crabs, among others (Sandison and Hill, 1966; Onyema, et al 2007). The mainstay of communities that live around this environment is artisanal fishing.

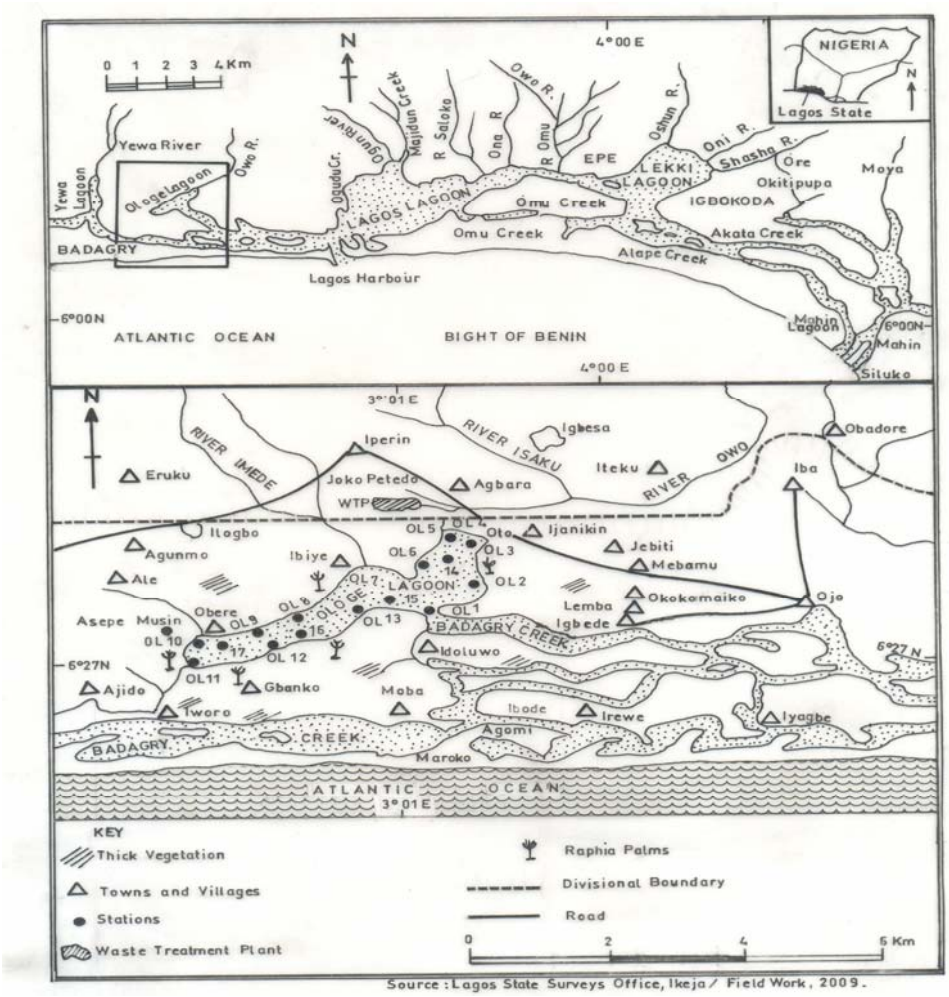

Fig 1: Ologe lagoon showing sampling stations

MATERIALS AND METHODS

A motorized boat and a Global Positioning System (GPS) were used in seventeen sampling stations during the 24 months sampling period (February 2002-January 2004). These stations were chosen to reflect differences in environmental gradients which exist in the same body of water. All samples were taking using standard plankton net of 55 μm mesh size towed steadily for 10 min at low speed and preserved in 4% unbuffered formalin in appropriately labeled plastic container.

All samples were collected during the hours of daylight to minimize variations due to diurnal migration. To enhance diatom identification sub samples of the original samples were acid-cleaned using nitric acid and investigation was made using Olympus BX51 photomicroscope at the Protistology and Aquatic Ecology Research Laboratory, University of Ghent, Belgium. Taxanomic keys employed in the identification included Hustedt (1930, 1937, 1942, 1971), Patrick and Reimer (1966, 1975), Prescott (1973, 1982), Round (1991), and Van-Den et al (1998).

RESULTS

As shown in table 1, out of a total of forty-five diatom taxa belonging to eighteen genera were observed in this study, twenty-nine were pennates while sixteen are centric forms. Species indicated in asterisk are first reports for Lagos lagoon complex.

Table (1): A checklist of diatom species of the Ologe lagoon

DIVISION: BACILLARIOPHYTA
CLASS: BACILLARIOPHYCEAE
ORDER 1:CENTRALES
Aulacoseira granulata (Ehr.) Sim.
A. granulata var.angustissima (O.F.Mullar) Sim.
A. granulata var.angustissima f.spiralis Hust.
A. granulata var.angustissima f.curvata (Hust.) Sim.
A. granulata var.muzzaensis (Meist.) Hust
A. islandica (O. Muller)
Stephanocyclus sp
Cyclotella meneghiniana (Kutzing)
C.striata (Kutz.) Grunow
C.stelligera Cleve ex Grunow
Coscinodiscus centralis Ehrenberg
C. eccentricus Ehrenberg
Melosira varians Agargh
Actinoptychus sp
Biddulphia laevis Ehrenberg
Terpsinoe musica Ehrenberg
ORDER 11: PENNALES
Synedra ulna (Nitzschia) Ehr
S.acus Kutzing
Nitzschia palea (Kutz) W.M.Smith
N. closterium (Ehr.) W.M.Smith
N. acicularis (Kutz.) W.M.Smith
N.vermicularis Hantzsch
Pinnularia major (Kutz.) Cleve
P. interrupta W.M.Smith
P.laevis (Ehr.) Compere
P.hemiptera (Kutz.) Rabenh.
P.ambigua Cleve
Pinnularia sp
Navicula oblonga Ehrenberg
N. radiosa Kutzing
N. gracilis Ehrenberg
N. mutica Kutzing

N. cuspidata Meist
Cocconeis placentula (Ehr.) Cleve
C. Disculum (Schum) Cleve
Epithemia sp
Cymbella affinis Kutzing
C. minuta Hisle ex.Rabenh
Eunotia gracilis Meister
E.lunaris (Ehr.) Grunow
E.monodon Ehrenberg
Surirella elegans Ehrenberg
S. ovata Kutzing
Fragilaria construens Ehrenberg
Gomphonema parvulum Kutzing

DISCUSSION

The number of diatoms taxa (45) observed in Ologe lagoon is very low compared to other published study from other lagoons and rivers so far. This checklist is the first that will record such low number of diatoms possibly due to high eutrophication in the lagoon. The pennales recorded higher number of taxa followed by centrals. This is in comformity with the species composition and phytoplankton abundance density found for some diatom species of Lagos lagoon (Nwankwo, 1990), some coastal waters of Nigeria (Kadiri, 1999) and Bonny River during complex research study concerning ecosystem of Niger Delta (RPI Report, 1985). The pennales were more prevalent and could be as a result of rainfall which introduces flooding thereby mixing up the water, boat navigation since artisanal fishing is the mainstay of the people living around the area or may be due to their possession of raphe with which they adhere to suitable substrate. From the checklist it can be stated that Ologe lagoon was dominated by single floristic grouping with Aulacoseira granulata and its varieties being more abundant species all through the stations.

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