A checklist of phytoplankton species of Ologe lagoon, Lagos south-western Nigeria

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Abstract: The phytoplankton diversity of the Ologe lagoon, Lagos was investigated from February, 2002 to January, 2004. Five main algal groups were recorded namely: Bacillariophyta, Cyanophyta, Euglenophyta, Pyrrhophyta and Chlorophyta. A total of 119 species belonging to 49 genera were observed. Diatoms formed the most abundant group making up 48 species from 18 genera. This was followed by green algae, with thirty-two species from fourteen genera, Cyanobacteria, with twenty-three species from eleven genera, euglenoids with seventeen species from five genera, while the dinoflagelates had one species. There were more prevalence of pennate diatoms and green algae during the wet season than the dry season, while the euglenoids were more prevalent during the dry season. Comparatively, a higher number of species was recorded in the dry than in the wet season. Nine phytoplankton species were reported to be potentially harmful/toxic bloom species. 57 bio-indicator species were recorded during the period of study. With regard to existing checklist of phytoplankton species, 10 new species are the first reports for Lagos lagoon complex, south-western Nigeria. [Journal of American Science 2010;6(9):297-302]. (ISSN: 1545-1003).

Key Words: Lagoon, checklist, algae, phytoplankton, diatoms, Ologe lagoon

INTRODUCTION

Checklists of phytoplankton species in Nigeria have been documented by different workers even from the last century (Mills, 1932; Fox, 1957,; Holden and Green, 1960; Imevbore, 1965; Egborge, 1973; Nwadiaro and Ezefili, 1986). More recently, a checklist of algae in the plankton from the Bonny River have received attention from Chinda and Pudo (1991) while Kadiri (1999) presented a list of phytoplankton species in some coastal waters of Nigeria and Opute (1991) presented a similar list for the phytoplankton of Warri/Forcados estuary.

In the last 50 years or so, there has been increasing interest in phytoplankton studies of Lagos lagoon complex (Nwankwo *et al.*, 2003a). Nwankwo *et al.* (2003a, b) published an additional list of 126 taxa to the already existing checklist for the Lagos lagoon (Nwankwo, 1988) after 15 years of additional investigations in the Lagos lagoon. A first list of chrysophytes has also been documented by Wujek *et al.*(2004) for the Epe lagoon. In a pioneering report of phytoplankton species in off shore waters of Nigeria, Nwankwo and Onyema (2004) published a list of 63 species from offshore Lagos.

Presently, there is no published work on the phytoplankton of the Ologe lagoon. These species form the primary foundation of this environment hence their dire importance to trophic relationship in the lagoon. The aim of this study was to investigate the phytoplankton community of the Ologe lagoon and provide a systematic list that will therefore be useful in measuring our knowledge of the lagoon phytoplankton in the region and Nigeria.

MATERIALS AND METHODS

Study Site

The Ologe lagoon (Fig 1) is located in Lagos State, Nigeria and is one of the nine lagoons in South-western Nigeria (Webb, 1958; Nwankwo, 2004b). It is pressumbaly the smallest of the lagoons in South Western Nigeria with a surface area of 9.4km^2, 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). The harmmattan, a short season of dry, dusty North-East Trade winds is experienced sometimes between November and January in the region reducing visibility and lowering temperatures. Dense rain forest zone vegetation preceded by littoral raphia palm

assemblages is the common macrofloral assemblages especially in areas with reduced anthropogenic influence.

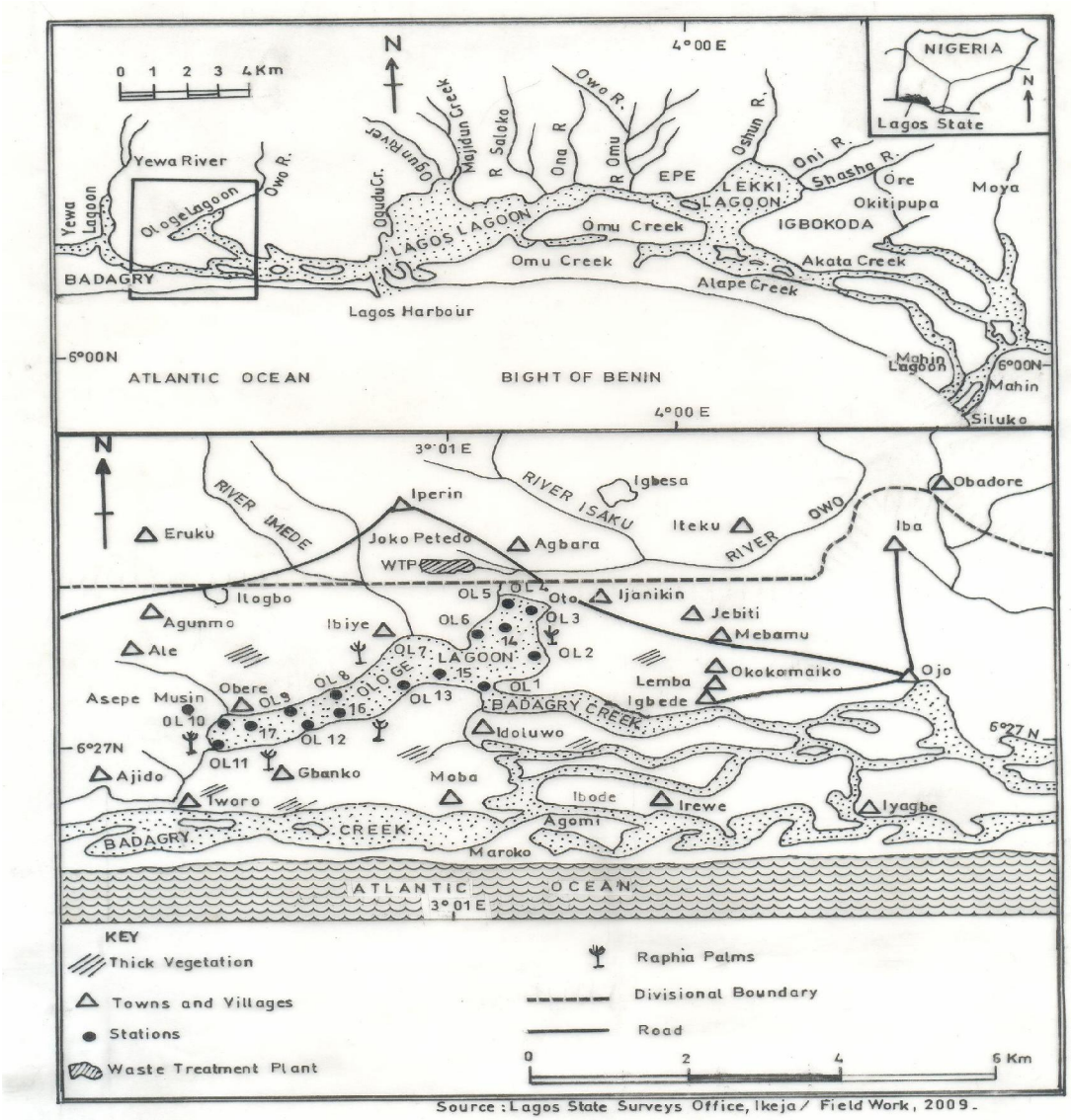

Fig. 1: Parts of Ologe lagoon Showing Sampling Stations.

Collection of Phytoplankton Samples

Phytoplankton sample was collected on each occasion and station with a 55 µm mesh size standard plankton net towed from a motorized boat for 5 min at low speed (<4 knots). The net was hauled in and the sample transferred into 250 ml. well labeled plastic container with screw cap. Each sample was preserved with 4% unbuffered formalin and stored in the laboratory. The preserved samples were later taken to Protistology and Aquatic Ecology Research Laboratory, University of Ghent, Belgium for taxonomic studies and scanning electron microscopy. After 48hrs and prior to microscope analysis, samples were concentrated to 10 mL (Nwankwo, 1984).

Biological Analysis

In the laboratory, one drop of the concentrated sample, five different times for each sample was investigated at different magnifications (X100 and X400) using a Wild M11 binocular microscope with a calibrated eye piece. The microtransect drop count method described by Lackey (1938) and employed by Nwankwo (1984) was used. Since each drop is 0.1 mL and two drops were used for each sample amount, results on

abundance were multiplied by 5 to give the values as numbers of organisms per mL. Appropriate texts were used to aid identification (Smith, 1950; Hendey, 1958, 1964; Desikachery, 1959; Wimpenny, 1966; Patrick and Reimer, 1966, 1975; Whitford and Schmacher, 1973; Valandingham, 1982; Nwankwo, 1984, 1990, 2004a; Bettrons and Castrejon, 1999; Siver, 2003; Rosowski, 2003).

RESULTS

The Phytoplankton Flora of the Ologe Lagoon

Five major algal groups were represented in the micro-flora of sampled areas of the Ologe lagoon. These were the Bacillariophyceae, Cyanophyceae, Euglenophyceae, Chlorophyceae, and Dinophyceae. A total of 119 species from 49 genera were recorded. Diatoms were the most abundant group making up a total of forty-eight species belonging to eighteen genera. This was followed by green algae, with thirty-two species from fourteen genera, Cyanobacteria, with twenty-three species from eleven genera, euglenoids with seventeen species from five genera, while the dinoflagelates had one species. The inter and intra-annual variations in phytoplankton assemblages was dominated by diatom species. There were more prevalence of pennate diatoms and green algae during the wet season than the dry season, while the euglenoids were more prevalent during the dry season. Table 1 shows a checklist of Ologe lagoon phytoplankton species and their classification. Species that are first reports for South-western Nigeria with regard to existing checklists (Nwankwo, 1988; Nwankwo *et al.*, 2003a, b; Nwankwo and Onyema, 2004; Wujek *et al.*, 2004) are preceeded by an asterick on the list (Table 1).

Table 1: A checklist of phytotoplankton species of the Ologe lagoon

DIVISION: BACILLARIOPHYTA
CLASS: BACILLARIOPHYCEAE
ORDER 1:CENTRALES
Aulacoseira granulata (Ehr.) Sim.
*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
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

DIVISION: CHLOROPHYTA
CLASS: CHLOROPHYCEAE
ORDER I: CHLOROCOCCALES
Pediastrum simplex (Meyer) Lemm
P. duplex Meyer
P. tetras (Ehr.) Ralfs
P. boyanum (Turpin) Meneghini
S. quadriacuada (Turp.) Breb
*S. dimorphus (Turp.) Kutzing
S. arcuatus Lemm.
A. falcatus (Corda) Ralfs.
Tetraedron sp

ORDER II:VOVOLVOCALES
Volvox aureus Ehrenberg
V. africana Ehrenberg
Eudorina elegans Ehrenberg

ORDER III: ZEGNEMATALES
Staurastrum leptocladium Nordst
Staurastrum paradoxum Meyen
Staurastrum sp
Desmidium swartzii Ag
Micrasterias sp
Spirogyra africana (Fritsch) Czurda
Zygnema sp
Closterium ehrenbergii Menegh
C. aciculare T.West
C. kuetzingii Breb.

C. intermidium Ralfs
Spondylosum sp
Cosmarium sp
DIVISION: EUGLENOPHYTA
CLASS: EUGLENOPHYCEAE
ORDER: EUGLENALES
Euglena acus Ehrenberg
E. caudat Hubner
E. convoluta Korishikor
E. viridis
E. polymorpha Dangeard
Euglena spirogyra Ehrenberg
Lepocinolis sp
Phacus accuminatus Stokes
P. longicauda Duj.
P. orbicularis Hubner
P. curvicauda Swir
P. tortus (Lemm) Skvort
Trachelomonas caudata stein
T. hispida Lemm
T. armata (Ehr.) Stein
T. acanthostoma (St) Deft
Eutreptia sp

DIVISION: CYANOPHYTA
CLASS: CYANOPHYCEAE
ORDER I: CHROOCOCCALES
Microcystis aeruginosa Kutzing
M. flos-aquae Kirchn.
M.wesenbergii Komark
Merismopedia glauca Ehr. Nag.
Gloeocapsa decortisans

ORDER II: HORMOGONALES
Spirulina major Kutzing
S. princeps W.et G.S.West
S. platenensis Geitler
Spirulina jenneri Geitler
Aphanocapsa sp
Aphanothece sp
Anabaenopsis sp
Anabaea spiroides Klebahn
A. flos-aquae Elenkin
Lyngbya contorta Lemm.
L. circumcreta Lemm
L. limnetica Lemm
*Oscillatoria formosa Bory
O. limnetica Lemm.
O. nigro-viridis Thwaites
Nostoc sphaerica Vaucher
*N. linckia Bornet et Thuret
* N. caeruleum Lyngbye
DIVISION:DINOPHYTA
CLASS:DINOPHYCEAE
ORDER:PERIDANALES
Peridinium cintum Bory

DISCUSSION

In the Ologe lagoon phytoplankton diversity was higher in the dry than the wet season and diatoms were more important group among the phytoplankton categories recorded. Nwankwo (1988) have already reported that phytoplankton production in the Lagos lagoon was high and principally dominated by diatoms. Similar dominance of diatoms among phytoplankton assemblages have been reported by other ecologists in the coastal waters of Nigeria (Imevbore, 2006). Similarly, Nwankwo, 1988, 1998a, b; Nwankwo and Onyema, 2004; Onyema and Nwankwo, 2006). Similarly, Onyema *et al.* (2003, 2007) reported diatoms dominating the phytoplankton spectrum of the Lagos lagoon. In the Ologe lagoon pinnate diatoms were more in number than the centric diatoms. They attributed the numerous pennate forms recorded to the effect of scouring action of flood waters that probably scours up the phytobenthic forms into the plankton of the Lagos lagoon complex. The flushing of planktonic algal forms towards the sea during the rains by flood waters, could also account for the reduced phytoplankton diversity in the wet season. Similarly, reduced phytoplankton diversity in the wet season may be linked to the low water clarity which reduces the amount of light available to the planktonic algal component for photosynthesis. Onyema and Nwankwo (2006) have also reported similar inferences for the Ijora creek phytoplankton regime.

In the Ologe lagoon, there existed environmental gradients from the habour to areas in the lagoon further inland and the phytoplankton assemblages and distribution reflected these trends. The exact trend of environmental characteristics and trends were not known for the lagoon till now.

Nine phytoplankton species were reported to be potentially harmful/toxic bloom species Nwankwo *et al.* (2003b) have already reported on the toxins/potentially for the Lagos lagoon.. 57 bio-indicator species were recorded during the period of study. With regard to existing checklist of phytoplankton species, 10 new species are the first reports for Lagos lagoon complex, south-western Nigeria. The observed range of chlorophyll-a concentration within Ologe lagoon showed that the lagoon was eutrophic. There is need for other extensive ecological studies to be carried out in the Ologe lagoon.

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