

Full Length Research Paper

Checklist of tropical algae of Togo in the Guinean Gulf of West-Africa

ISSIFOU Liassou¹, ATANLÉ Kossivi¹, RADJI Raoufou^{1,2}, LAWSON H. Latekoe¹, ADJONOU Kossi^{1,2}, EDORH M. Thérèse¹, KOKUTSE A. Dzifa², MENSAH A. Akossiwoa³ and KOKOU Kouami^{2*}

¹Laboratory of Algology and Palynology, Faculty of Science, University of Lomé, P. O. Box 1515, Lomé, Togo.

²Laboratory of Botany and Plant Ecology, Faculty of Science, University of Lomé, P. O. Box 1515, Lomé, Togo.

³Laboratory of Plant Physiology and Biotechnology, Faculty of Science, University of Lomé, P. O. Box 1515, Lomé, Togo.

Received 9 September, 2014; Accepted 13 November, 2014

The phytoplankton is an important part of the biodiversity and one of the bases of food networks of freshwater, brackish and marine environments. This study is carried out to record the algae flora (microalgae and macroalgae) in Togo regarding the floristic diversities. The results show that 795 species of microalgae have been recorded in Togo belonging to 134 families, nineteen groups among which the most important in terms of number of species are the Bacillariophyceae (26%), Cyanophyceae (17%), Chlorophyceae (16%), Conjugatophyceae (12%) and Euglenophyceae (11%). The microalgae of Togo belong to 7 Divisions which are respectively Chromophyta (39%), Chlorophyta (32%), Cyanophyta (17%), Euglenophyta (11%), and Rodophyta (1%). More than 250 genera were recorded and the most represented genera are *Navicula*, *Nitzschia*, *Scenedesmus*, *Trachelomonas*, *Closterium*, *Cosmarium*, *Oscillatoria*, *Phacus*, *Pinnularia*, *Staurastrum*, *Strombomonas*, *Lyngbya* that cover 31% of microalga of Togo. For the macroalgae, 37 taxons were collected in total. Three Divisions of the macroalgae notably the Chlorophyta, Pheophyta and Rhodophyta are the most represented. The dominant species are from the Chlorophyta Division. These studies are still ongoing to improve the knowledge about the biodiversity of the aquatic environments algae in Togo.

Key words: Guinean Gulf, Togo, aquatic ecosystem, phytoplankton, microalgae, macroalgae.

INTRODUCTION

The phytoplankton constitutes the primary production in the watercourses and oceans (Field et al., 1998; Behrenfeld et al., 2001). It also constitutes an important part of the biodiversity and one of the bases of food networks of freshwater, brackish and marine environments (Tourte et

al., 2005).

In Togo, the researches conducted on plants covered a large portion of Angiosperms. But the researches on the phytoplankton and the algae in particular are relatively recent (Atanlé et al., 2013; Radji et al., 2013). Very

*Corresponding author. E-mail: kokoukouami@hotmail.com, Tel: (+228) 90020411.

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](http://creativecommons.org/licenses/by/4.0/)

recently, the Advanced Learning Support Project (PAES) in the West African Economic and Monetary Union - UEMOA - (Project: P-Z1-IAD-002N°2100155007376), enabled to extend the prospections on the phytoplankton nationwide.

This regain of interest in the phytoplankton organisms in Togo is motivated today by the fact that in the search for solution against the negative effects of climate change, these species as well as the macroflora contribute to the reduction of the greenhouse gases notably the carbon dioxide (Sayre, 2010). Moreover, they are also involved in the production of fertilizers, agro-food and cosmetic products, biofuel, antibiotics etc. (Cadoret and Bernard, 2008; Farid et al., 2009; Sydney et al., 2010; Priyadarshani and Rath, 2012). The phytoplankton study reveals to be very crucial because of its ecological, environmental, dietary, pharmacological and socio-economic importance. However, before getting to the implementations and valorizations of the phytoplankton flora in Togo, it is necessary to know their diversity. Thus, this study aims at analysing the algae flora (microalgae and macroalgae) in terms of floristic diversities, number of families, groups and main Divisions which compose the species in Togo. The targeted objective is to create a check-list and occurrences list of the phytoplankton species in Togo that will be the starting point for the drafting of the algae flora until now inexistent.

MATERIALS AND METHODS

The study zone

This study was conducted in Togo, located on the coast of the Gulf of Guinea in West Africa. The country covers an area of 56 600 km² and shares borders with the Atlantic Ocean in the South, Burkina Faso in the North, Benin in the East and Ghana in the West. Located in between the 6th and the 11th degree of latitude and between the 0th and 2nd degree of east longitude, the country stretches from North to South over 660 km. Its breadth varies between 50 and 150 km. Togo belongs to the muggy intertropical area marked by two main high speed currents. This intertropical climate varies markedly from the Southern regions to the Northern regions. Globally, the Southern regions have 4 seasons: a long dry season, from mid-November to March, a large rainy season, from March/April to July, a small dry season, from August to September and a small rainy season, from September to mid-November. The Central and Northern regions are characterized by two seasons: the rainy season (May to October) and the dry season (November to April). The rainfall varies from 882 to 1328 mm in the Southern regions and from 1000 to 1302 mm in the Northern regions. For the temperature, it varies from 26.4 to 27.4°C in the Southern regions and from 26.4 to 28.3 in the Northern regions. The relative average moisture is high in the Southern zones (73 to 78.5%) but low in the Northern regions (56 to 67%). The average evapotranspiration is of 1540 mm/year. From this ecological diversity, Togo offers a wide research field for the phytoplankton thanks to the multitude aquatic ecosystems (marine environment, streams, rivers, lakes, pools, etc.). The main aquatic ecosystems considered in this study can be grouped into:

(1) Lotic environment made up of (i) aquatic ecosystems of hydrologic regime influenced by the Sudanian Climate with one dry

season and one rainy season notably along the Oti River and its affluents (Koumongou, Kara and Mô), the Mono River and its affluents (Ogou, Anié, Amou and Khra) and (ii) aquatic ecosystems of hydrologic regime influenced by the sub-equatorial climate with two rainy seasons that alternate with two dry seasons. It takes into account the Haho stream, the Zio stream and its main tributary the Lili;

(2) Lentic environment: it's about lakes, lagoons and ponds in the South of Togo. Some of these watercourses are brackish and others are freshwaters. It includes also the Atlantic Ocean. Indeed, Togo is endowed with a coastline that stretches from West to East over a width 50 km, between the 6°01 and 6°05 latitudes Nord and the 0°70 and 1°40 longitudes East. The coastline is mainly sandy and has been subject for some years now to so severe marine erosion (Blivi, 1993). The offshore environment covers an area of 371 km. It is made up of a relatively flat and deep narrow continental table. It is 23 km wide and 100 m isobathic. The ocean bottoms are essentially sandy and sandy silt. Meanwhile there are many beach sandstone submarine levellings between 350 and 500 m from the coast. Togo has a special feature of beach-rock which is a geological formation made up of ancient corral reefs, today striped naked by the coastal erosion. This dead corral reef almost parallel at the shore is present on the sandy bottom in correspondance with 52 to 56 m isobathic over about 15 to 17 km along the coast. Beyond and up to the plateau fall, a large number of reef heads can be noticed. In the Gulf of Guinea, the sea surface temperature varies normally between 25 and 29°C but can fall down to 20°C during the upwelling of cold water (Segniagbeto and Van Waerebeek, 2010). The Guinean current is the main current in the Gulf of Guinea. It is supplied by the northern equatorial off Liberia and flows toward the East alongside the coast of Ghana, Togo, Bénin and Nigeria. The Gulf of Guinea concave topography deviate the Current of Guinea towards West that results into the South Equatorial Current. Upwellings of water rich of nutriments occur in the months of July and September as well as in January. The Gulf of Guinea tides originate from the South West. This concerns semi-diurnal tides with two irregularities. The tides height ranges from 1 to 3.5 m (during the storm). The macroalgae have been harvested in this environment. These aquatic ecosystems are distributed into the 3 main watershed catchment basins of Togo notably the Volta basin, the Mono basin and the Lac Togo basin.

Data collection

The data collection took into account all the seasons of the year 2013 and covered all the aquatic ecosystems of Togo. For each site of water sample collection, the geographic coordinates are taken with the Global Positioning System (GPS) and positioned on the watershed catchment basin map of Togo thanks to MapInfo Professional software (Figure 1). Two different data collection approaches were used. For the microalgae, the samplings are conducted at 20 cm of the water surface for the surface waters (less than 50 cm depth). For the deep areas (>50 cm), the samplings are conducted at three levels (surface, mid-depth and depth) using an integrated water sampler bottle (Druart and Rimet, 2008). In all 135 water samples were collected nationwide in pillbox of 250 ml. After sampling, the phytoplankton was immediately fixed by an 1% concentrated lugol's solution which gives a light brown colour to the sample (Thronsdén, 1978) and enables to better preserve the structure of the algae cells (Druart et al., 2005). The samples are kept in a cool place and in darkness up to the Palynology and Algology laboratory of the Faculty of Science of the University of Lomé. Each sample is left to rest for 24 h minimum to enable the sedimentation of the algae (Nielsen, 1933). Water was later on sampled on top of the algae residue through siphonage. The concentrated algae water residue was conserved in the pillbox. For the identification of the phytoplankton, a water drop is sampled

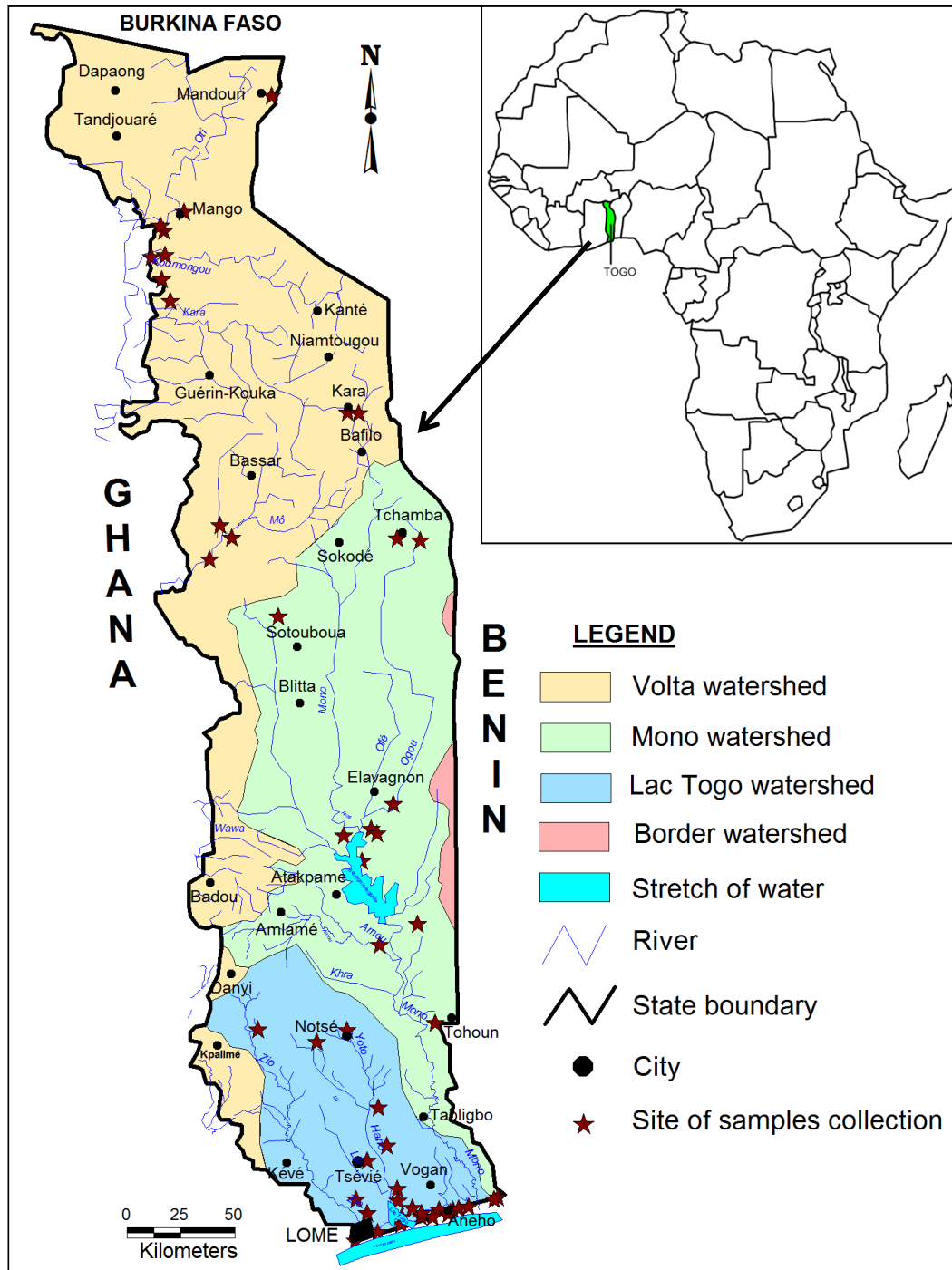


Figure 1. Siting of sampling.

thanks to a Pasteur pipette. This drop is deposited in between slides then observed with the photon microscope adapted to a light room and a camera connected to a computer. The observation is repeated 3 times for the same site in order to establish the algae composition of each site, that is, 405 observations. The observations are done according to vertical scannings. The pictures are taken with 10X and 40X objectives. As for Diatomeae, the identification level and taxonomy is hard, thus, oil immersion and

100X objectives were used. From the observations and the pictures, the identification of the species is done thanks to the works of Lauterborn (1915), Skuja (1956), Grönblad et al. (1958), Coute and Rousselin (1975), Komarèk and Anagnostidis (1995), Sournia (1968), Compere (1991), of Krammer and Lange-Bertalot (1986-2000), of Bourrelly (1968, 1970, 1972, 1990), and of Lavoie et al. (2008). For the macroalgae, the collections concern essentially the seaweeds. For this effect sampling are considered



Photo 1. Seaweeds cropping up on the beach-rock in low normal tides.

Table 1. Most represented genera of microalgae in Togo.

Group/Genera	Family	Representatives in the genera	
		Number of species	% compared to the total number of genera
I- Bacillariophyceae			
<i>Navicula</i>	Naviculaceae	31	4
<i>Nitzschia</i>	Nitzschiaceae	22	3
<i>Pinnularia</i>	Naviculaceae	16	2
II- Chlorophyceae			
<i>Scenedesmus</i>	Scenedesmaceae	29	4
<i>Closterium</i>	Desmidiaceae	24	3
<i>Cosmarium</i>	Desmidiaceae	24	3
<i>Staurastrum</i>	Desmidiaceae	14	2
III- Cyanophyceae			
<i>Oscillatoria</i>	Oscillatoriaceae	22	3
<i>Lyngbya</i>	Oscillatoriaceae	8	1
IV- Euglenophyceae			
<i>Trachelomonas</i>	Euglenaceae	27	3
<i>Phacus</i>	Euglenaceae	18	2
<i>Strombomonas</i>	Euglenaceae	9	1

over the coastline. The samples are taken during low tide on the hard substrata on foot in the encroachment zones and other hard substrata of the coastline by diving. The fishermen's nets once back from sea are scrutinized to find algae brought in. Moreover, more systematic harvest was conducted on the beach-rock, after obtaining from the captaincy of the Port Authority of Lomé pieces of information about the daily schedule of the low tides during which a larger part of the beach-rock shows on the surface (Photo 1). The algae are placed in vials filled with seawater to be identified in laboratory. The identification is carried out at the laboratory through direct the observation by means of microscope for the very little size specimen. After the identification, the specimens are kept at the Herbarium of the University of Lomé after a stay in the 4% formol. The classification of the algae per division, group, order and family being too complex and varied from one source to the other, the base list used in this article relied on AlgaeBase (Guiry and Guiry, 2014).

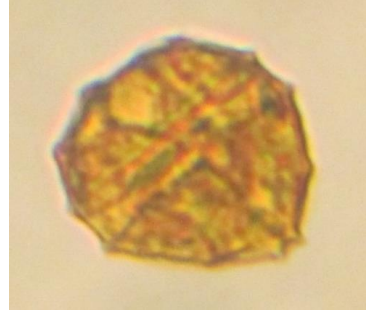
RESULTS

Microalgae's Richness in Togo

Presently, 795 species of microalgae have been recorded in Togo including 83% species totally identified and 17% identified only by the genera (Annexes). In total, 282 genera were recorded and the most represented genera are *Navicula*, *Nitzschia*, *Scenedesmus*, *Trachelomonas*, *Closterium*, *Cosmarium*, *Oscillatoria*, *Phacus*, *Pinnularia*, *Staurastrum*, *Strombomonas*, *Lyngbya* that cover 31% of microalgae of Togo (Table 1, Photo 2). The microalgae belong to 134 families of which the most represented (having more than 10 species) are the *Desmidiaceae*, *Euglenaceae*, *Scenedesmaceae*, *Naviculaceae*,



Oscillatoria platensis
Nordst
(Cyanophyceae)



Peridiniopsis sp.
(Dinophyceae)



Euglena oxyuris
Schmarda
(Euglenophyceae)



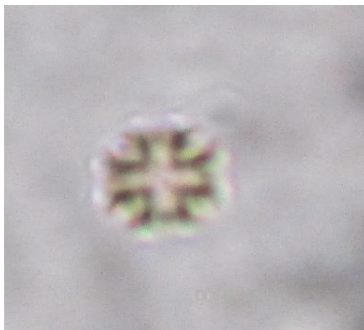
Phormidium tenue
Anagnostidis & Komárek
(Cyanophyceae)



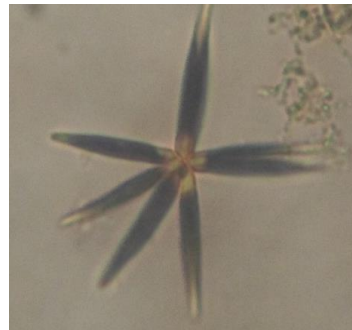
Closterium lineatum
Ehrenberg ex Ralfs
(Conjugatophyceae)



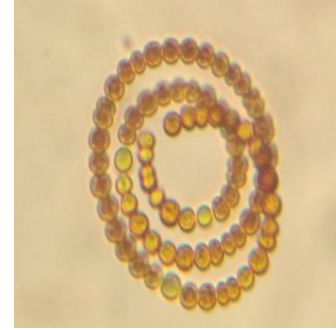
Hyaloraphidium contortium Pasch. y
Korch
(Chlorophyceae)



Pediastrum tetras
(Ehrenberg) Ralfs
(Chlorophyceae)



Actinastrum hantzschii
Lagerh
(Chlorophyceae)



Anabaena spiroides
Lemm.
(Cyanophyceae)

Photo 2. Some specimen of microalgae in Togo.

Oscillatoriaceae, *Bacillariaceae*, *Phacaceae*,
Nostocaceae, *Fragilariaceae*, *Pinnulariaceae*,
Hydrodictyceae, *Eunotiaceae*, *Gomphosphariaceae*,
Chlamydomonadaceae, *Oocystaceae*,
Merismopediaceae, *Diplopsliaceae*, *Selenastraceae*,

Stephanodiscaceae. These families cover 74% of algae plant community in Togo (Table 2). These most represented genera belong essentially to the most represented families in Togo. Nineteen groups make up the whole microalgae in Togo but the most important in

Table 2. Richness of microalgae families in Togo.

Group/Family	Representative in the family Number of species	% compared to the total number of families
1- Bacillariophyceae		
<i>Naviculaceae</i>	44	6
<i>Bacillariaceae</i>	34	4
<i>Pinnulariaceae</i>	17	2
<i>Eunotiaceae</i>	14	2
2- Chlorophyceae		
<i>Desmidiaceae</i>	81	10
<i>Scenedesmaceae</i>	53	7
<i>Hydrodictyceae</i>	15	2
<i>Chlamydomonadaceae</i>	12	2
<i>Oocystaceae</i>	12	2
<i>Selenastraceae</i>	10	1
3- Euglenophyceae		
<i>Euglenaceae</i>	54	7
<i>Phacaceae</i>	27	3
4-Cyanophyceae		
<i>Oscillatoriaceae</i>	36	5
<i>Nostocaceae</i>	21	3
<i>Gomphosphaeriaceae</i>	13	2
<i>Merismopediaceae</i>	11	1
5- Fragilariophyceae		
<i>Fragilariaceae</i>	19	2
6- Dinophyceae		
<i>Diplopsaliaceae</i>	10	1
7- Coscinodiscophyceae		
<i>Stephanodiscaceae</i>	10	1

terms of species richness are the Bacillariophyceae (26%), Cyanophyceae (17%), Chlorophyceae (16%), Conjugatophyceae (12%), Euglenophyceae (11%), Dinophyceae, Fragilariophyceae and Trebouxiophyceae (3%), Xanthophyceae (2%). Chrysophyceae, Cryptophyceae, Synurophyceae and Ulvophyceae contain respectively 1% of the algae flora. The Nephrophyceae, Rhodophyceae, Raphidophyceae and Stylonematophyceae are also a group that are present in Togo but in a low proportion (Table 3). The microalga of Togo belong to 7 Divisions which are respectively Chromophyta (39%), Chlorophyta (32%), Cyanophyta (17%), Euglenophyta (11%), Rodophyta (1%) (Figure 2).

Macroalgae richness in Togo

In total 37 taxa were collected and 27 from them were identified to the genera or to the species (Table 4, Photo 3). Three Divisions of macroalgae notably Chlorophyta, Phaeophyta and Rhodophyta are the most represented in term of number of species. The Chlorophyta (green

algae) dominates with 9 species.

DISCUSSION

This study is the most important to have carried out a relatively exhaustive analysis on the richness of the algae in Togo. On about 1,100 genera and 14,000 species spread in the world (Ilitis, 1980), 795 species of microalgae are grouped in 282 genera and 37 macroalgae in about 20 genera were identified, in other words, a contribution of about 2.3% of the world algae flora. This richness is very high compared to the precedent studies during which many authors tried to collect phytoplankton species in Togo. Indeed, during the research works in the freshwater ecosystems (lakes and lagoons) of Southern Togo, Edorh et al. (2008), Léné (2004), Bandje (2010), Gnofam (2010), Issifou (2012) and Radji et al. (2013) indexed a specific algae richness of about 200 taxa of microalgae. These authors showed that in these areas, the Chromophyta with the species such as *Cyclotella bodanica* Eulenstein ex Grunow, C.

Table 3. Most represented groups of microalgae in Togo in term of species.

Division/Group	Representatives in the group Number of species	% compared to the total number of Divisions
I- Chromophyta		
<i>Bacillariophyceae</i>	204	26
<i>Coccinodiscophyceae</i>	30	4
<i>Dinophyceae</i>	27	3
<i>Fragilariophyceae</i>	23	3
<i>Xanthophyceae</i>	15	2
<i>Chrysophyceae</i>	6	1
<i>Cryptophyceae</i>	5	1
<i>Synurophyceae</i>	5	1
II- Chlorophyta		
<i>Chlorophyceae</i>	126	16
<i>Conjugatophyceae</i>	95	12
<i>Trebouxiophyceae</i>	21	3
<i>Ulvophyceae</i>	8	1
<i>Nephrophyceae</i>	1	-
<i>Raphidophyceae</i>	1	-
III- Cyanophyta		
<i>Cyanophyceae</i>	132	17
IV- Euglenophyta		
<i>Euglenophyceae</i>	91	11
V- Rhodophyta		
<i>Florideophyceae</i>	3	-
<i>Rhodophyceae</i>	1	-
<i>Stylonematophyceae</i>	1	-

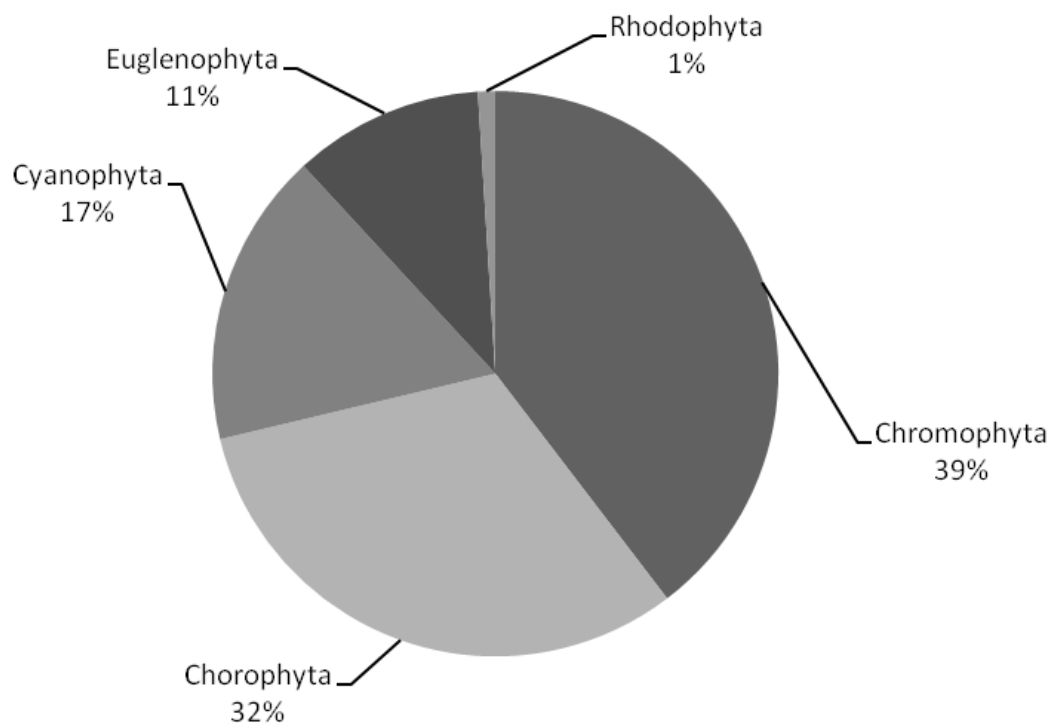
**Figure 2.** Distribution of the microalgae Division in Togo.

Table 4. Macroalgae collected in Togo.

Groups	Orders	Families	Species
Chlorophyta	Ulvales	Ulvaceae	<i>Ulva lactuca</i> L.
			<i>Ulva compressa</i> L.
			<i>Ulva rigida</i> C. Agardh
	Bryopsidales	Codiaceae	<i>Codium</i> sp.
		Caulerpaceae	<i>Caulerpa</i> sp.
		Bryopsidaceae	<i>Bryopsis plumosa</i> C. Agardh
Cladophorales	Cladophoraceae	<i>Chaetomorpha aerea</i> (Dillwiyn) Kützing	
		<i>Chaetomorpha implexa</i> Feldmann	
		<i>Cladophora laetevirens</i> (Dillwiyn) Kützing	
Phaeophyta	Laminariales	Laminariaceae	<i>Laminaria</i> sp.
	Fucales	Fucaceae	<i>Fucus ceranoides</i> L.
			<i>Fucus spiralis</i> L.
		Sargassaceae	<i>Sargassum muticum</i> (Yendo) Fensholt <i>Sargassum</i> sp.
	Dictyotales	Dictyotaceae	<i>Padina pavonica</i> (L.) Thivy <i>Dictyota dichotoma</i> (Hudson) J.V. Lamouroux
	Ectocarpales	Scytosiphonaceae	<i>Colpomenia peregrina</i> Sauvageau
Rhodophyta	Gigartinales	Cytocloniaceae	<i>Hypnea musciformis</i> (Wulfen) J.V. Lamouroux
		Petrocelidaceae	<i>Mastocarpus stellatus</i> (Estackhouse) Guiry
		Phylloporaceae	<i>Phyllophora</i> sp.
	Gracilariales	Gracilariaceae	<i>Gracilaria</i> sp.
	Bangiales	Bangiaceae	<i>Porphyra</i> sp.
	Rhodymeniales	Lomentariaceae	<i>Lomentaria clavellosa</i> (Lightfoot ex Turner) Gaillon
		Champiaceae	<i>Champia parvula</i> (C. Agardh) Harvey
	Palmariales	Palmariaceae	<i>Palmaria palmata</i> (L.) Weber & Mohr
Ceramiales	Rhodomelaceae	<i>Laurencia obtusa</i> (Hudson) J.V. Lamouroux	
Corallinales	Corallinaceae	<i>Lithophyllum byssoides</i> (Lamarck) Foslie	

compta Kütz., *Fragilaria ulna* Kitton, *Cymbella* spp. (mostly Diatomophyceae), the Chlorophyta such as *Hyaloraphidium contortium* Pasch. y Korch., *Crucigenia tetrapedia* Kirch., *Scenedesmus quadricauta* Bréb, *Closterium closterioides* (Ralfs) Louis et Peeters, *Cosmarium quadrum* Lundell, etc., and the Cyanophyta such as *Oscillatoria platensis* Nordst., *O. margaritifera* Kützing ex Gomont, *O. limosa* Gom., *Isocystis planctonica* Starmach, *Microcystis aeruginosa* (Kützing) Kützing, *Synechococcus aquatilis* Sauv., are the dominant groups. The current study shows that considering the whole territory, it is still the same groups of Chromophyta (39%), of Chlorophyta (32%) and of Cyanophyta (17%) that dominate, confirming therefore the observations of these authors. Only these three groups represent 88% of the algae in Togo. The same observations are made by Iltis (1980) that confirm that the tropical algae flora is made up of a high proportion of representatives from the three groups.

With regard to the Togolese marine macroalgae, the

only serious existing reference nowadays is Bandje (2004) that had identified 14 species of macroalgae of which 9 species fixed to the beach-rocks of the Togolese coast. This marine flora is far from reflecting the reality, making always unknown the marine flora of Togo. The current algae flora and the one indicated by Bandjé (2004) are far from the results of the first inventory of Colocoloff (1980). This author reported the presence of 170 species distributed in 37 families. The most represented genera are *Gracilaria* (12 species), *Ceramium* (8 species), *Gelidiopsis* (7 species), *Hypnea* (7 species), *Laurencia* (7 species), *Caulerpa* (4 species), *Chaetomorpha* (4 species), *Cladophora* (4 species), *Codium* (5 species), *Gracilariopsis* (4 species). These results from Colocoloff (1980) show that the Togolese marine environment is characterized by a diversified algae flora and that the studies are only at their beginning. The *Sargassum* genus is very abundant on the whole Togolese coast. Moreover, the analysis of the Togolese algae flora also shows that the Chromophyta occupy a great proportion



Ulva lactuca L.
(Chlorophyta)



Codium sp
(Chlorophyta)



Fucus spiralis L.
(Phaeophyta)



Sargassum muticum
(Yendo) Fensholt
(Phaeophyta)



Hypnea musciformis
(Wulfen) J.V. Lamouroux
(Rhodophyta)



Chaetomorpha aerea
(Dillwyn) Kützing
(Chlorophyta)



Cladophora laetevirens
(Dillwyn) Kützing
(Chlorophyta)



Porphyra sp
(Rhodophyta)



Padina pavonica (L.)
Thivy
(Phaeophyta)

Photo 3. Some specimen of macroalgae of Togo.

(39%) on the whole algae flora in Togo. This situation is not a particularity for Togo. Many other studies showed in different aquatic ecosystems that it is the Chromophyta (generally the Diatomeae) that dominate the algae flora (Cetto et al., 2004; Felisberto and Rodrigues, 2005; Fonseca et al., 2008). These authors explain this dominance by the fact that the Diatomophyceae occupy a great number of species and is also higher in density; which make them great competitors of nutrients in the aquatic habitats (Vermaat, 2005). Then the Diatomophyceae are equipped with morphological

structures that make them efficient in terms of space conquest in aquatic environment (Feng et al., 2011). From all the evidence, the algae flora of Togo is very rich and diversified but has been partially studied. Compared to Niger, the algae flora identified has 547 species dominated by the Cyanophyceae, the Diatomophyceae and the Eulichlorophyceae (Saadou, 1998). In Senegal, the inventory of the algae has started just as in Togo, indicating 133 genera and about 83 species (Compère, 1991). This author remarked that the freshwater and brackish algae are more numerous as well as the

microscopic algae must have had a special attention to complete the inventory. In many other countries in the sub-region, research works are conducted on the phytoplankton but the contrast remains the same; they are generally fragmented to have sufficient information among others on the biogeographical distribution over a continent. Globally it is demonstrated that the microalgae are cosmopolite with more than 60% met in diverse regions of the world while the species typically tropical represent about 40% (Iltis, 1980; Zongo et al., 2008).

It should also be mentioned that in the processing of the algae flora of Togo, some cases of potentially toxic algae were mentioned (Edorh et al., 2008; Bandje, 2010; Issifou, 2012). It is about *Anabaena* spp., *Merismopedia* spp., *Microcystis aeruginosa* (Kützing) Kützing, *Nitzschia bilobata* W.Smith, and *Oscillatoria rubescens* De Cand. These ones must be subject to a particular attention in the future works to analyse the level of nuisance for many of the rural populations depending on surface waters which are the privilege habitats of these algae.

Conclusion

It results from this study that in Togo, the knowledge about the biodiversity of the algae from the aquatic environments in Togo is advancing. In all 795 species of microalgae belong to 82 genera, 134 families and 5 branches are the most dominant in Togo. Moreover, 37 taxa of macroalgae belonging to 3 Divisions notably the Chlorophyta, Pheophyta and Rhodophyta have been collected up to now. This first stage is necessary to further assume the studies on the distribution, the valorization of the phytoplankton biomass and the search for solution vis-à-vis the nuisance of the toxic species present in the surface waters used by the rural populations. The future research works must therefore be oriented towards this purpose.

Conflict of Interest

The authors have not declared any conflict of interest.

ACKNOWLEDGEMENTS

This work was conducted in the frame work of the Advanced Learning Support Project (PAES) in the member states of the West African Economic and Monetary Union – WAEMU P- Z1 – IAD – 002, Don : 2100155007376. The authors express their sincere gratitude to the West African Economic and Monetary Union.

REFERENCES

Atanlé K, Bawa LM, Kokou K, Djaneye-Boundjou G, Edorh MT (2013). Distribution saisonnière du phytoplancton en fonction des

caractéristiques physico-chimiques du lac de Zowla (Lac Boko) dans le Sud-Est du Togo: Cas de la petite saison sèche et de la grande saison sèche. *Journal of Applied Biosciences (JABs)* 64:4847-4857. <http://dx.doi.org/10.4314/jab.v64i1.88474>

Bandje A (2004). Recensement des algues marines du Togo: caractérisation et distribution; Mém. Ing. Travaux; GEE-ESTBA/UL., 43 pp.

Bandje A (2010). Diversité et dynamique du phytoplancton dans les écosystèmes aquatiques du sud-ouest du Togo; Mém. DEA-FDS/UL, 46 pp.

Behrenfeld MJB, James T, Randerson JT, McClain RC, Feldman CG, Los OS, Tucker JC, Falkowski GP, Field B C, Field FR, Esaias EW, Kolber DD, Pollack NH (2001). Biospheric primary production during an ENSO transition. *Science* 291:2594-2597. <http://dx.doi.org/10.1126/science.1055071>

Bliivi A. (1993). Géomorphologie et dynamique actuelle du littoral du Golfe du Bénin (Afrique de l'Ouest). Thèse de doctorat, Université de Bordeaux III., 458 pp.

Bourrelly P (1968). Les algues jaunes et brunes (Tome II). Ed. Boubée: Paris, pp. 438.

Bourrelly P (1970). Les algues bleues et rouges (Tome I). Ed. Boubée: Paris, p. 511. Bourrelly p. 1972. Les algues vertes (Tome III). Ed. Boubée: Paris, pp. 572.

Bourrelly P (1972). Les Algues d'eau douce. Initiation à la Systématique. Les Algues vertes Jaunes et les Brunes, et les Algues Bleues et Rouges. Paris, éd. N. Boubée.

Bourrelly P (1990). Les Algues d'Eau Douce. Initiation à la Systématique. Tome I: les Algues Vertes. Ed. Boubée: Paris, 511 pp.

Cadoret PP, Bernard O (2008). La production de biocarburant lipidique avec des micro-algues: Promesses et défis. *J. de la Société de Biologie*, 202(3):201-211. <http://dx.doi.org/10.1051/jbio:2008022>

Cetto JM, Leandrini JA, Felisberto SA, Rodrigues L (2004). Periphyton algae community in Irai reservoir, Parana State, Brazil, *Acta Scientiarum: Biol. Sci.* 26(1):1-7.

Colocoloff C (1980). Rapport de prospection sur les algues marines du Togo. Document Interne, Faculté des Sciences, Université de Lomé.

Compère P (1991). Contribution à l'étude des algues du Sénégal I: Algues du lac de Guiers et du Bas-Sénégal. *Bull. Jardin Botanique Nat Belg.*, 61:171-267. <http://dx.doi.org/10.2307/3668149>

Coute A, Rousselin F (1975). Contribution à l'étude des algues d'eau douce du Moyen Niger (Mali). *Bul. Mus. Nat. Hist. Nat. Paris Ser. 3*, 277 Bot., 21:73-176.

Druart JC, Rimet F (2008). Protocoles d'analyse du phytoplancton de l'INRA: Prélèvement, dénombrement et biovolumes. INRA-Thonon, Rapport SHL 283 96 pp.

Druart JC, Robert M, Tadonleke R. (2005). The phytoplankton of Lake Geneva. *Rap. Com. Int. pro. Eaux Léman contre pollution*. pp. 89-100.

Edorh T, Bliivi A, Bandje A, Abotsi K (2008). Présence d'algues toxiques dans les eaux marines et saumâtres du littoral togolais. *Annales des Sciences Agronomiques du Bénin* 10(2):165-177.

Farid Y, Etahiri S, Assobhei O (2009). Activité antimicrobienne des algues marines de la lagune d'Oualidia (Maroc): Criblage et optimisation de la période de la récolte. *J. Appl. Biosci.* 24:1543-1552.

Felisberto SA, Rodrigues L (2005). Comunidades de algas perifíticas em reservatórios de diferentes latitudes. In: L. Rodrigues L, S.M. Thomaz SM, A.A. Agostinho AA, L.C. Gomes LC (Eds.), *Biocenoses em Reservatórios: Padroes Espaciais e Temporais*, Rima, Sao Carlos, pp. 97-114.

Feng J, Wang F, Xie S (2011). Structure and dynamics of the periphytic algae of Jinyang Lake in Shanxi Province, North China. *Acta Ecologica Sinica* 31:310-316. <http://dx.doi.org/10.1016/j.chnaes.2011.07.003>

Field CB, Behrenfeld MJ, Randerson JT, Falkowski P (1998). Primary production of the biosphere: Integrating terrestrial and oceanic components. *Science* 281:237-240. <http://dx.doi.org/10.1126/science.281.5374.237>

Fonseca IA, Siqueira NS, Rodrigues L (2008). Algas perifíticas a montante e a jusante do local de instalacao de tanques-rede em tributarios do reservatorio de Rosana, Estado do Parana, Brasil, *Acta Scientiarum: Biological Sciences.* 31(2):135-141.

- Gnofam N (2010). Variation saisonnière des paramètres physico-chimiques et du phytoplancton du lac de Zowla (lac Boko); Mém. Ing. Travaux; GEE-ESTBA/UL 47 pp.
- Grönblad R, Prowse GA, Scott AM (1958). Sudanese Desmids. *Acta Botanica Fennica* 58:1-82.
- Guiry MD, Guiry GM (2014). *Algae Base*. World-wide electronic publication, National University of Ireland, Galway. <http://www.algaebase.org>.
- Iltis A (1980). Les Algues. In Durand J-R (ed.), Lévêque C. (ed.). *Flore et faune aquatiques de l'Afrique sahélo-soudanienne: tome 1*. Paris : ORSTOM, 1980, pp. 9-61. (Initiations-Documentations Techniques; 44). <http://www.documentation.ird.fr/hor/fdi:00552>
- Issifou L (2012). Contribution à l'étude de la diversité et de la dynamique du phytoplancton de la lagune de Lomé; Mém. Ing. Travaux; GEE-ESTBA/UL 44 pp.
- Komarèk J, Anagnostidis K (1995). *Cyanoprokaryota. Sübwasserflora von Mitteleuropa* pp. 49-96.
- Krammer (de) K, Lange-Bertalot H (1986-2000). *Bacillariophyceae*. In: *Süßwasserflora von Mitteleuropa* (Ettl H., Gerloff J., Heynig H., Mollenhauer D., eds). Spektrum Akademischer Verlag, Heidelberg, Berlin, pp. 1-5.
- Lauterborn R (1915). Die sapropelische lebewelt. (Ein Beitrag zur biologie des Faulschlammes. Natürlicher Gewässer) *Verh. Naturhist. Mediz. Ver. Heidelberg, N.F.*, 13:317-323.
- Lavoie I, Hamilton PB, Campeau S, Grenier M, Dillon PJ (2008). *Guide d'identification des Diatomées des Rivières de l'Est du Canada*. Presses de l'Université de Québec, 341 pp.
- Léné F (2004). Evaluation de l'état actuel de la lagune de Lomé; Mém. Ing. Travaux; GEE-ESTBA/Université de Lomé; 46 pp.
- Nielsen ES (1933). *Über Quantitative Untersuchungen von Marine Plankton mit Utermohl's umgekehrten Mikroskop*. *Journal du Conseil International pour l'Exploration de la Mer*. 8:201-210. <http://dx.doi.org/10.1093/icesjms/8.2.201>
- Priyadarshani I, Rath R (2012). Commercial and industrial applications of micro algae – A review. *J. Algal Biomass Utiln.* 3(4):89-100.
- Radji R, Bandje A, Issifou L, Etorh T, Kokou K (2013). Diversité et dynamique des assemblages phytoplanctoniques dans les écosystèmes aquatiques au Sud du Togo. *Afrique Sci.* 9(2). <http://www.afriquescience.info/document.php?id=2781>. ISSN 1813-548X.
- Saadou M (1998). Evaluation de la biodiversité biologique au Niger: éléments constitutifs de la biodiversité végétale. Conseil National de l'Environnement pour un Développement Durable SE/CNEDD. *Projet NER/97/G31/A/1G/99, "Stratégie Nationale et plan d'action - Diversité Biologique"*, 138 pp.
- Sayre R (2010). *Microalgae: The Potential for Carbon Capture*. *BioScience* 60:722–727. ISSN 0006-3568, electronic ISSN 1525-3244.
- Segniabeto G, Van Waerebeek K (2010). A note on the occurrence and status of cetaceans in Togo. IWC Scientific Committee document SC/62SM11.
- Skuja H (1956). *Taxonomische und biologische Studien über das Phytoplankton Schwedischer Binnengewässer*. *Nova acta regiae societatis scientiarum. Upsaliensis Ser.* 4, 16, 3:1-404.
- Sournia A (1968). *Diatomées planctoniques du Canal de Mozambique et de l'île Maurice*. *Mem. O.R.S.T.O.M.*, 31. Paris, 120 pp.
- Sydney EB, Sturm W, de Carvalho JC, Thomaz-Soccol V, Larroche C, Pandey A, Soccol CR (2010). Potential carbon dioxide fixation by industrially important microalgae. *Bioresour. Technol.* 101:5892-5896. <http://dx.doi.org/10.1016/j.biortech.2010.02.088>
- Thronsen J (1978). *Preservation and storage*. In *Phytoplankton manual. Monographs on oceanographic methodology*, Sournia A (ed). UNESCO, pp. 67-74.
- Tourte Y, Bordonneau M, Henry M, Tourte C (2005). *Le monde des végétaux: organisation, physiologie et génomique*; Paris: Dunod, 384 pp.
- Vermaat JE (2005). *Periphyton dynamics and influencing factors*. In: M.E. Azim, M.C.J. Verdegem, AA Van Dam, MCM Bederidge (Eds.), *Periphyton Ecology, Exploitation and Management*, CABI Publishing, Cambridge.
- Zongo F, Zongo B, Boussim JI, Coute A (2008). Nouveaux taxa de micro-algues dulçaquicoles pour le Burkina Faso (Afrique de l'Ouest): I-Chlorophyta. *Int. J. Biol. Chem. Sci.* 2(4):508-528.

ANNEXES

Checklist of Togolese Microalgae.

Division/Group	Family	Species
I-Chlorophyta		
1.1- Chlorophyceae	1.1.1- Chaetopeltidaceae	<i>Chaetopeltis orbicularis</i> Berthold <i>Leptosiropsis torulosa</i> C.-C.Jao <i>Stigeoclonium tenue</i> (C.Agardh) Kützing <i>Uronema elongatum</i> Hodgetts
	1.1.2- Characiaceae	<i>Actidesmium hookeri</i> Renisch <i>Korshikoviella schaefernai</i> (Fott) P.C.Silva
	1.1.3- Chlamydomonadaceae	<i>Carteria micronucleolata</i> Korshikov <i>Carteria multifilis</i> (Fresenius) O. Dill <i>Carteria simplex</i> Pascher. <i>Carteria</i> sp. <i>Chlamydomonas caudata</i> Wille. <i>Chlamydomonas coccifera</i> Gorosch. <i>Chlamydomonas globosa</i> J.W.Snow <i>Chlamydomonas muriella</i> Lund <i>Chlamydomonas pertusa</i> Chodat <i>Chlamydomonas</i> sp. <i>Sphaerella</i> sp. <i>Tussetia</i> sp.
	1.1.4- Chlorangiopsidaceae	<i>Gloeochloris minor</i> Korch.
	1.1.5- Chlorococcaceae	<i>Crucigeniella crucifera</i> Näg. <i>Nautococcus piriformis</i> Korshikov <i>Schroederia indica</i> Philipose. <i>Schroederia seligera</i> (Schroed.) Lemm. <i>Spongiochloris spongiosa</i> (Vischer) R.C.Starr
	1.1.6- Dictyosphaeriaceae	<i>Dictyosphaerium pulchellum</i> Wood <i>Quadriococcus ellipticus</i> Loc. Sauv. <i>Westella botryoides</i> (West) De Wildeman
	1.1.7- Dunaliellaceae	<i>Dunaliella</i> sp.
	1.1.8- Haematococcaceae	<i>Chlorogonium elongatum</i> (P.A.Dangeard) Francé <i>Chlorogonium fusiforme</i> Matvienko <i>Chlorogonium</i> sp.
	1.1.9- Hydrodictyceae	<i>Monoraphidium braunii</i> (Nägeli) Komárková-Legnerová <i>Monoraphidium contortum</i> (Thuret in Bréb.) Kom-Legnerová <i>Monoraphidium griffithii</i> (Brek.) Kom <i>Pediastrum aciculare</i> T. West <i>Pediastrum angilosum</i> Racib. <i>Pediastrum duplex</i> Meyen <i>Pediastrum</i> sp <i>Pediastrum tetras</i> (Ehrenberg) Ralfs <i>Tetraedron tumidulum</i> (Reinsch) Hansgirg <i>Tetraedron muticum</i> (A.Braun) Hansgirg <i>Tetraedron</i> sp. <i>Tetraedron triangulare</i> Korshikov <i>Tetraedron tumidulum</i> Hansg. <i>Tetraspora gelatinosa</i> (Vaucher) Desvaux
	1.1.10- Micractniaceae	<i>Micractinum pusillum</i> Fresenius <i>Phytelios viridis</i> Frenzel

Annexes Contd.

1.1.11- Neochloridaceae	<i>Golenkinia radiata</i> Choda
1.1.12- Oedogoniaceae	<i>Oedogonium globosum</i> Nordstedt ex Hirn
1.1.13- Palmellopsidaceae	<i>Asterococcus superbus</i> (Cienk.) Scherffel
1.1.14- Protosiphonaceae	<i>Protosiphon botryoides</i> (Kützing) Klebs
1.1.15- Radiococcaceae	<i>Coenochloris ovalis</i> Korshikov <i>Coenochloris</i> sp. <i>Thorakochloris planctonica</i> Fott.
1.1.16- Rhopalosolenaceae	<i>Kentrosphaera facciolae</i> Borzi <i>Pseudochlorothecium</i> sp.
1.1.17- Scenedesmaceae	<i>Actinastrum aciculare</i> Playf. <i>Actinastrum hantzschii</i> Lagerh. <i>Actinastrum</i> sp. <i>Ankistrodesmus bibraianus</i> (Reinsch) Koršikov <i>Ankistrodesmus fusiformis</i> Corda <i>Ankistrodesmus gracilis</i> (Reinsch) Korshikov <i>Ankistrodesmus</i> sp. <i>Ankistrodesmus spiralis</i> (W.B.Turner) <i>Ankistrodesmus viridis</i> (J.Snow) Bourrelly <i>Coelastrum cambricum</i> Arch. <i>Coelastrum pseudomicroporum</i> Korsch. <i>Coelastrum reticulatum</i> (P.A.Dangeard) Senn <i>Crucigenia crucifera</i> (Wolle) Collins <i>Crucigenia fenestrata</i> (Schmidle) Schmidle <i>Crucigenia quadrata</i> Morren <i>Crucigenia rectangularis</i> Näg. <i>Crucigenia</i> sp. <i>Crucigenia tetrapedia</i> Kirch. <i>Dimorphococcus lunatus</i> A.Braun <i>Golenkinia</i> sp. <i>Palmella</i> sp. <i>Scenedesmus abundans</i> (O.Kirchner) Chodat <i>Scenedesmus acuminatus</i> (Lagerheim) Chodat <i>Scenedesmus acutus</i> Meyen <i>Scenedesmus armatus</i> (R.Chodat) R.Chodat <i>Scenedesmus bicaudatus</i> Dedusenko <i>Scenedesmus carinatus</i> (Lemmermann) E.H.Hegewald. <i>Scenedesmus circumfusus</i> Hortobágyi <i>Scenedesmus crassus</i> Chodat <i>Scenedesmus denticulatus</i> Lagerheim <i>Scenedesmus dimorphus</i> Kütz. <i>Scenedesmus disciformis</i> Chod. <i>Scenedesmus dispar</i> Brébisson <i>Scenedesmus ecornis</i> Meyen f. <i>Scenedesmus flexuosus</i> (Lemmermann) Ahlstrom. <i>Scenedesmus grahneisii</i> (Heynig) Fott <i>Scenedesmus granulatus</i> West. <i>Scenedesmus gutwinski</i> Chodat (P. Bourrelly <i>Scenedesmus incrassatus</i> Bohlin. <i>Scenedesmus intermedius</i> Chodat <i>Scenedesmus nygaardii</i> Huber <i>Scenedesmus obliquus</i> Kütz. <i>Scenedesmus obtusus</i> Meyen

Annexes Contd.

	<i>Scenedesmus opoliensis</i> P.G. Richt.
	<i>Scenedesmus protuberans</i> F.E.Fritsch & M.F.Rich
	<i>Scenedesmus quadricauta</i> Bréb.
	<i>Scenedesmus smithii</i> Teiling. In: Guiry, M.D. & Guiry, G.M
	<i>Scenedesmus</i> sp.
	<i>Scenedesmus tenuispina</i> Chodat
	<i>Scenedesmus wisconsinensis</i> G.M.Smith
	<i>Tetrastrum heterocanthum</i> (Nordstedt) Chodat.
	<i>Tetrastrum staurogeniaeforme</i> Lemm.
	<i>Treubaria</i> sp
1.1.18- Schizomeridaceae	<i>Schizomeris leibleinii</i> Kützing
1.1.19- Selenastraceae	<i>Hyaloraphidium contortium</i> Pasch. y Korch.
	<i>Hyaloraphidium</i> sp.
	<i>Kirchneriella contorta</i> (Schmidle) Bohlin
	<i>Kirchneriella obesa</i> (West) West & G.S.West
	<i>Monoraphidium arcuatum</i> (Korshikov) Hindák
	<i>Monoraphidium convolutum</i> (Corda) Komárková-Legnerová
	<i>Monoraphidium griffithii</i> Legn.
	<i>Monoraphidium minutum</i> (Nägeli)Komárková-Legnerová
	<i>Monoraphidium</i> sp.
	<i>Selenastrum bibraianum</i> Reinsch
1.1.20- Sphaerocystidaceae	<i>Sphaerocystis schroeteri</i> Chodat
1.1.21- Treubariaceae	<i>Treubaria triappendiculata</i> C.Bernard
1.1.22- Volvocaceae	<i>Gonium</i> sp.
	<i>Volvox aureus</i> Ehrenberg
	<i>Volvox glabator</i> (Linné) Ehr.
	<i>Volvox</i> sp
1.2- Conjugatophyceae	1.2.1- Desmidiaceae
	<i>Actinotaenium cucurbita</i> (Bréb.) Teiling
	<i>Closterium aciculare</i> T.West
	<i>Closterium acutum</i> Bréb. ex Ralfs
	<i>Closterium closterioides</i> (Ralfs) Louis et Peeters
	<i>Closterium cynthia</i> De Notaris
	<i>Closterium diana</i> Ehrbg.
	<i>Closterium ehrenbergii</i> Menegh. ex Ralfs
	<i>Closterium gracile</i> Brebisson
	<i>Closterium intermedium</i> Ralfs
	<i>Closterium kuetzingii</i> Bréb.
	<i>Closterium lanceolatum</i> (Kützing.) in Ralfs
	<i>Closterium leibleinii</i> Kützing
	<i>Closterium lineatum</i> Ehrenberg ex Ralfs
	<i>Closterium longissimum</i> L.Viret.
	<i>Closterium lunula</i> (Müller) Nitzsch. ex Ralfs
	<i>Closterium macilentum</i> Bréb.
	<i>Closterium monileferum</i> (Bory) Ehrenberg ex Ralfs
	<i>Closterium navicula</i> (Bréb.) Lütkemüller
	<i>Closterium parvulum</i> Näg.
	<i>Closterium pseudolunula</i> Borge
	<i>Closterium</i> sp.
	<i>Closterium strigosum</i> Bréb.
	<i>Closterium subulatum</i> (Kützing) Brebisson
	<i>Closterium tumidulum</i> Johnson
	<i>Closterium venus</i> Kützing ex Ralfs

Annexes Contd.

Coelastrum microporum Näg.
Coelastrum proboscideum Bohlin in Wittrock, Nordstedt & Lagerheim
Coelastrum pulchrum Näg.
Coelastrum sp.
Cosmarium anomalum Delponte
Cosmarium binum Nordstedt
Cosmarium botrylis Menegh.
Cosmarium candianum Delponte
Cosmarium circulare Reinsch
Cosmarium contractum Kirchner
Cosmarium cornutum Corda
Cosmarium decoratum West et West
Cosmarium demersum Noda & Skvortzov
Cosmarium depressum (Nägeli) P.Lundell
Cosmarium dimaziforme (Grönbl.) Sc.+ Grönbl. v. concavum F.
Cosmarium laeve Rabenhorst
Cosmarium lundellii Delp.
Cosmarium pachidermum Luud. El Pardo
Cosmarium pseudoconnatum Nordstedt
Cosmarium quadratum Ralfs
Cosmarium quadratum Lundell
Cosmarium rectangulare var. *hexagonum* (Elfving) West & G.S.West.
Cosmarium redimitum Borge.
Cosmarium sp.
Cosmarium subauriculatum West & G.S.West
Cosmarium trilobulatum Reinsch
Cosmarium vexatum West.
Cosmarium zonatum Lundell
Desmidium swartzii Agardh
Docidium hexagonum (Börger.) Krieger.
Euastrum ansatum Ehrenberg ex Ralfs
Euastrum denticulatum (Kirchner) Gay
Euastrum sp.
Euastrum spinulosum Delponte
Micrasterias radians W.B.Turner
Micrasterias sp.
Micrasterias thomasiana Arch.
Micrasterias truncata Brébisson ex Ralfs
Pleurotaenium ehrenbergii (Ralfs) Delponte
Pleurotaenium eugeneum (W.B.Turner) West & G.S.West
Pleurotaenium sp
Pleurotaenium spinulosum Brunel
Staurastrum apiculatum Brébisson
Staurastrum dickei var. *rhomboideum* f. *depressa* T.J.C.Irénée-Marie
Staurastrum eckertii K.Förster.
Staurastrum orbiculare Meneghini ex Ralfs
Staurastrum sebaldi Reinsch
Staurastrum selenaeum R.L.Grönblad.

Annexes Contd.

		<i>Staurastrum sexangulare</i> (Bulnheim) P.Lundell
		<i>Staurastrum</i> sp.
		<i>Staurastrum subunguiferum</i> F.E.Fritsch & M.F.Rich.
		<i>Staurastrum teliferum</i> Ralfs
		<i>Staurastrum volans</i> West & G.S.West
		<i>Staurastrum wildemanii</i> Gutwinski
		<i>Staurodesmus dickiei</i> S. Lillieroth
		<i>Streptonema</i> sp.
	1.2.2- Gonatozygaceae	<i>Genicularia spirotaenium</i> Ramb.
		<i>Gonatozygon monotaenium</i> De Bary
	1.2.3- Mesotaeniaceae	<i>Mesotaenium macrococcum</i> (Kützing ex Kützing) J.Roy & Bisset
		<i>Netrium digitatus</i> (Ehr.) Itzigsohn & Rothe
		<i>Spirotaenia condensata</i> Brebisson in Ralfs
		<i>Spirotaenia minuta</i> Thuret in Brébisson
		<i>Spirotaenia</i> sp.
	1.2.4- Peniaceae	<i>Penium cylindrus</i> (Ehr.) Brébisson ex Ralfs
		<i>Penium magaritaceum</i> (Ehr.) Brébisson ex Ralfs
		<i>Penium</i> sp.
	1.2.5- Zygnematacea	<i>Mougeotia floridana</i> Transeau
		<i>Mougeotia scalaris</i> Hassall
		<i>Mougeotia</i> sp.
		<i>Spirogyra</i> sp.
1.3- Nephrophyceae	1.3.1- Nephroselmidaceae	<i>Myochloris</i> sp.
1.4- Trebouxiophyceae	1.4.1- Botryococcaceae	<i>Botryococcus braunii</i> Kützing
	1.4.2- Chlorellaceae	<i>Chlorella</i> sp.
		<i>Chloridella</i> sp.
		<i>Closteriopsis acicularis</i> (Chodat) J.H.Belcher & Swale
		<i>Closteriopsis longissimum</i> Smith
		<i>Muriella terrestris</i> J.B.Petersen
	1.4.3- Oocystaceae	<i>Chodatella echidna</i> (Bohlin) Chod.
		<i>Eremosphaera gigas</i> (W.Archer) Fott & Kalina
		<i>Gloxiidium rotatoriae</i> Korshikov.
		<i>Lagerheimia ciliata</i> (Lagerheim) Chodat
		<i>Netrium digitus</i> Itzigson et Rothe
		<i>Oocystaenium</i> sp.
		<i>Oocystis borgei</i> J.W.Snow
		<i>Oocystis elliptica</i> West
		<i>Oocystis lacustris</i> Chodat
		<i>Oocystis</i> sp.
		<i>Planctonema</i> sp.
		<i>Saturnella corticola</i> Skuja) Fott
	1.4.4- Prasiolaceae	<i>Stichococcus bacillaris</i> Nägeli
	1.4.5- Trebouxiaceae	<i>Dictyochloropsis</i> sp.
		<i>Raphidonema nivale</i> Lagerheim
1.5- Ulvophyceae	1.5.1- Cladophoraceae	<i>Cladophora crystallina</i> (Roth) Kützing
		<i>Cladophora</i> sp.
		<i>Cloniophora</i> sp.
	1.5.2- Gloeotilaceae	<i>Binuclearia eriensis</i> Tiffany.
		<i>Ulothrix</i> sp.
		<i>Ulothrix zonata</i> (Weber & Mohr) Kützing
	1.5.3- Ulvaceae	<i>Enteromorpha intatinalis</i> (Linnaeus) Nees

Annexes Contd.

II- Chromophyta

2.1- Bacillariophyceae

2.1.1- Achnantheaceae

Ulva sp.*Achnanthes brevipes* Bréb.*Achnanthes childanos* Hohn & Hellerman*Achnanthes flexella* (Kützing) Brun*Achnanthes inflata* (Kützing) Grunow*Achnanthes lanceolata* (Brébisson ex Kützing) Grunow*Achnanthes* sp

2.1.2- Amphipleuraceae

Amphipleura lindheimeri Grunow*Amphipleura pellucida* (Ehr.) Kütz.*Amphiprora alata* (Ehr.) Kütz.*Amphiprora paludosa* W.Smith*Frustulia rhomboides* (Ehrenberg) De Toni

2.1.3- Bacillariaceae

Bacillaria paxillifer (O.F.Müller) T.Marsson*Cylindrotheca gracile* (Brébisson) Grunow*Denticula pelagica* Hustedt.*Denticula* sp.*Denticula thermalis* Kützing*Gomphonitzchia ungeri* Grunow*Hantzschia amphioxys* (Ehrenberg) Grunow in Cleve & Grunow*Hantzschia elongata* (Hantzsch) Grunow*Hantzschia* sp.*Nitzschia acicularis* Smith*Nitzschia acuminata* (W. Smith) Grunow*Nitzschia amphibia* Grunow*Nitzschia bilobata* W.Smith*Nitzschia dissipata* (Kützing) Grunow*Nitzschia dubia* W.Smith*Nitzschiaepithemiodes* Grunow in. Cleve*Nitzschia hungarica* Grunow*Nitzschia ignorata* Krasske*Nitzschia levidensis* (W. Sm.) Grunow*Nitzschia linearis* Hantzsch.*Nitzschia longissima* (Brébisson) Ralfs*Nitzschia navicularis* (Brébisson) Grunow*Nitzschia palea* Kütz.*Nitzschia recta* Hantzsch ex Rabenhorst*Nitzschia reversa* Smith*Nitzschia scalaris* Ehrbg.*Nitzschia sigma* Kütz.*Nitzschia sinuata* (W. Sm.) Grun.*Nitzschia* sp.*Nitzschia tryblionella* Hantzsch*Nitzschia vermicularis* (Kützing) Ralfs*Pleurosigma angulatum* (Queckett) W.Smith*Pseudo-nitzschia pungens* (Grunow ex Cleve) G.R.Hasle

2.1.4- Catenulaceae

Amphora commutata Grunow*Amphora copulata* (Kützing) Schoeman & R.E.M.Archibald*Amphora lineolata* Ehrenberg*Amphora ovalis* (Kützing) Kützing*Amphora* sp.

Annexes Contd.

2.1.5- Chaetoceraceae	<i>Wollea saccata</i> Wolle
2.1.6- Chroomonadaceae	<i>Chroomonas</i> sp <i>Chroomonas minuta</i> Skuja. <i>Chroomonas rubra</i> (Geitler)
2.1.7- Cocconeidaceae	<i>Cocconeis placentula</i> (Ehr.) Grun.
2.1.8- Cymbellaceae	<i>Cymbella caespitosa</i> (Kützing) Brun <i>Cymbella cistula</i> (Ehrenberg) O.Kirchner <i>Cymbella cuspidata</i> Kützing. <i>Cymbella lacustris</i> (C.Agardh) Cleve <i>Cymbella prostata</i> (Berkeley)Cleve <i>Cymbella</i> sp. <i>Cymbella turgidula</i> Grun. <i>Cymbella ventricosa</i> Cleve
2.1.9- Diploneidaceae	<i>Diploneis didyma</i> (Ehrenberg) Ehrenberg <i>Diploneis elliptica</i> Cleve <i>Diploneis interrupta</i> Kütz. <i>Diploneis marginestriata</i> Cleve <i>Diploneis mauleri</i> (Brun) Cleve <i>Diploneis oculata</i> (Brébisson) Cleve <i>Diploneis ovalis</i> Cleve <i>Diploneis smithii</i> (Brébisson) Cleve <i>Diploneis interrupta</i> (Kützing) Cleve
2.1.10- Eunotiaceae	<i>Eunotia faba</i> Ehrbg. <i>Eunotia guyanense</i> (Ehr.) de Toni. <i>Eunotia incisa</i> W.Smith ex W.Gregory <i>Eunotia monodon</i> Ehrenberg <i>Eunotia parallela</i> Ehrbg. <i>Eunotia pectinalis</i> (Kützing) Rabenhorst <i>Eunotia robusta</i> Ralfs <i>Eunotia serpentina</i> Ehrenberg <i>Eunotia</i> sp. <i>Schizothrix fuscescens</i> Kützing ex Gomont <i>Schizothrix lacustris</i> A.Braun ex Gomont <i>Actinella</i> sp. <i>Actinella brasiliensis</i> Grunow. <i>Actinella mirabilis</i> Grunow
2.1.11- Gomphonemataceae	<i>Gomphoneis herculaneum</i> Ehrbg. <i>Gomphoneis intricatum</i> Kützing <i>Gomphonema acuminatum</i> Ehrenberg <i>Gomphonema angur</i> Ehr. <i>Gomphonema angustatum</i> Grun. <i>Gomphonema constrictum</i> Ehrbg. <i>Gomphonema gracile</i> Ehrenberg <i>Gomphonema intricatum</i> Kützing <i>Gomphonema olivaceum</i> (Hornemann) Brébisso <i>Gomphonema olivatum</i> Kütz. <i>Gomphonema</i> sp.
2.1.12- Mastagloioaceae	<i>Mastagloia pumilla</i> (Cleve & Möller) Cleve. <i>Mastagloia grevillei</i> (Hassall) Elenkin. <i>Mastagloia</i> sp. <i>Mastagloia smithii</i> Grun.
2.1.13- Naviculaceae	<i>Anemoeoneis sphaerophora</i> (Kutz.) Pfitz.

Annexes Contd.

-
- Aphanizomenon gracile* Lemm.
Caloneis amphisbaena (Bory de Saint Vincent) Cleve
Caloneis obtusa (W.Smith) Cleve
Caloneis permagma (Bailey) Cleve
Caloneis schumanniana (Grunow) Cleve
Caloneis sp.
Caloneis silicula (Ehrenberg) Cleve
Campylodiscus noricus Ehrbg
Navicula reinhardtii (Grunow) Grunow
Navicula americana Ehrbg.
Navicula amphibia f.
Navicula annulata Grun.
Navicula brevicostata (Cleve) Fricke
Navicula cocconeiformis Gregory ex Greville
Navicula confervacea (Kützing) Grunow
Navicula crucicula Lagerst
Navicula cryptocephala Kütz.
Navicula cuspidata Kütz.
Navicula dissipata Hustedt
Navicula elegans Smith
Navicula gallica (W. Smith) Van Heurck.
Navicula gastrum Ehrbg.
Navicula gibbula Cleve
Navicula integra Smith
Navicula lanceolata Ehrenberg
Navicula oblonga Kütz.
Navicula ovalis Smith
Navicula perigrina (Ehrenberg) Kützing
Navicula placenta Ehrbg.
Navicula placentula (Ehrenberg) Kützing
Navicula punctatae(Kützing) Donkin
Navicula pupula Kütz.
Navicula renhardtii Hérib.
Navicula rotunda Hustedt
Navicula seminulum Cleve
Navicula sp.
Navicula subtilissima Grunow
Navicula trivalis Lange-Bertalot. P. Benthic
Navicula tuscula (Ehrenberg) D.G.Mann & A.J.Stickle
Navicula viridula (Kützing) Ehrenberg
Raphidiopsis curvata Fristch.
Navicula cryptocephala Kütz.
Anemoeoneis serians Bréb.
2.1.14- Neidiaceae
Neidium affine Ehrbg.
Neidium productum (W.Smith) Cleve
Neidium sp.
2.1.15- Pinnulariaceae
Pinnularia acroesphaeria Raben.
Pinnularia borealis Ehrenberg
Pinnularia brebissonii (Kützing) Rabenhorst
Pinnularia breviscostata Cleve
Pinnularia cardinalis (Ehrenberg) W.Smith
Pinnularia divergentissima (Grunow) Cleve
-

Annexes Contd.

	<i>Pinnularia gibba</i> Ehrenberg
	<i>Pinnularia lata</i> (Brébisson) W.Smith
	<i>Pinnularia legumen</i> Ehrenberg
	<i>Pinnularia major</i> Ehrbg.
	<i>Pinnularia mesolepta</i> (Ehrenberg) W.Smith
	<i>Pinnularia neomajor</i> K.Krammer
	<i>Pinnularia platycephala</i> (Ehrenberg) Cleve
	<i>Pinnularia</i> sp.
	<i>Pinnularia undulata</i> W.Gregory.
	<i>Pinnularia viridis</i> (Nita) Ehr.
	<i>Diatomella hustedtii</i> E. E. Maguin
2.1.16- Pleuromastigaceae	<i>Gyrosigma acuminatum</i> Kütz.
	<i>Gyrosigma angulatum</i> Quekett) Griffith & Henfrey
	<i>Gyrosigma attenuatum</i> (Kützing) Cleve
	<i>Gyrosigma diminutum</i> (W.Smith) Cleve.
	<i>Gyrosigma hippocampus</i> (Ehrenberg) Hassall
	<i>Gyrosigma</i> sp.
	<i>Pleuromastix bacillifera</i> A.Scherffel
	<i>Xanthodiscus lauterbachii</i> Schewk.
2.1.17- Rhizosoleniaceae	<i>Rhizosolenia calcar-avis</i> M.Schultze
	<i>Rhizosolenia obtusa</i> Hensen
	<i>Rhizosolenia</i> sp.
2.1.18- Rhoicospheniaceae	<i>Rhoicosphenia curvata</i> (Kützing) Grunow
2.1.19- Rhopalodiaceae	<i>Epithemia argus</i> (Ehrenberg) Kützing
	<i>Epithemia hyndmanni</i> W. Smith
	<i>Epithemia</i> sp.
	<i>Epithemia turgida</i> Ehrbg.
	<i>Rhopalodia gibberula</i> (Ehrenberg) Otto Müller
	<i>Rhopalodia gibba</i> (Ehrenberg) Otto Müller
2.1.20- Stauroneidaceae	<i>Stauroneis acuta</i> W.Smith
	<i>Stauroneis anceps</i> Ehrbg.
	<i>Stauroneis brasiliensis</i> (C.Zimmermann) P.Compère
	<i>Stauroneis crucicula</i> Grun.
	<i>Stauroneis phoenicenteron</i> (Nitzsch) Ehrenberg
	<i>Stauroneis</i> sp.
2.1.21- Stephanodiscaceae	<i>Cyclotella bodanica</i> Eulenstein ex Grunow
	<i>Cyclotella comta</i> Kütz.
	<i>Cyclotella distinguenda</i> Hustedt
	<i>Cyclotella ocellata</i> Pantocsek
	<i>Cyclotella</i> sp.
	<i>Cyclotella stelligera</i> Cleve & Grunow
	<i>Cyclotella styriaca</i> Kütz.
	<i>Stephanodiscus parvus</i> Stoermer & Håkansson
	<i>Stephanodiscus astrae</i> (Ehrenberg) Grunow
2.1.22- Surirellaceae	<i>Surirella angustata</i> Kützing
	<i>Surirella biseriata</i> Brébisson in Brébisson & Godey
	<i>Surirella capronii</i> Bréb.
	<i>Surirella verrucosa</i> Pantocsek
	<i>Surirella robusta</i> Ehr.
	<i>Cymatopleura solea</i> (Brébisson & Godey) W. Smith
	<i>Stenopterobia intermedia</i> F.W.Lewis
2.2- Chrysophyceae	2.2.1- Chromulinaceae
	<i>Dinobryon</i> sp.

Annexes Contd.

		<i>Eusphaerella turfosa</i> Skuja
	2.2.2- Chrysosaccaceae	<i>Chrysosaccus</i> sp.
	2.2.3- Chrysosphaeraceae	<i>Chrysosphaera</i> sp.
	2.2.4- Dinobryaceae	<i>Dinobryon</i> sp.
	2.2.5- Hydruraceae	<i>Hydrurus foetidus</i> (Villars) Trevisan
2.3- Coscinodiscophyceae	2.3.1- Attheyaceae	<i>Attheya zachariasii</i> J. Brun
	2.3.2- Aulacoseiraceae	<i>Aulacoseira granulata</i> (Ehrenberg) Simonsen <i>Aulacoseira</i> sp.
	2.3.3. Biddulphiaceae	<i>Hydrosera</i> sp. <i>Biddulphia laevis</i> Ehrbg.
	2.3.4- Chaetocerotaceae	<i>Chaetoceros borealis</i> J.W. Bailey <i>Chaetoceros constrictus</i> Gran <i>Chaetoceros socialis</i> H.S.Lauder <i>Chaetoceros</i> sp.
	2.3.5- Coscinodiscaceae	<i>Coscinodiscus argus</i> Ehrenberg <i>Coscinodiscus lacustris</i> Grun. <i>Coscinodiscus</i> sp. <i>Coscinodiscus wailesii</i> Gran & Angst <i>Merismopedia tenuissima</i> Lemm. <i>Nodularia harveyana</i> Thuret. <i>Terpesinoe musica</i> Ehrbg.
	2.3.6- Hemiaulaceae	<i>Eucampia zodiacus</i> Ehrenberg <i>Cerataulina pelagica</i> (Cleve) Hendey <i>Actinocyclus octonarius</i> Ehrenberg
	2.3.7- Melosiraceae	<i>Melosira arenaria</i> Moore ex Ralfs <i>Melosira granulata</i> (Ehrenberg) Ralfs <i>Melosira italica</i> (Ehrenberg) Kützing <i>Melosira roeseana</i> Rabenhorst <i>Melosira</i> sp. <i>Melosira varians</i> Lemm.
	2.3.8- Paraliaceae	<i>Paralia sulcata</i> (Ehrenberg) Cleve
	2.3.9- Rhizosoniaceae	<i>Proboscia alata</i> (Brightwell) Sundström <i>Rhizoselenia fallax</i> Sundström
	2.3.10- Stephanodiscaceae	<i>Stephanodiscus</i> sp.
	2.3.11- Thalassiosiraceae	<i>Thalassiosira</i> sp.
2.4- Cryptophyceae	2.4.1- Cryptomonadaceae	<i>Cryptomonas ovata</i> Ehrenberg <i>Cryptomonas</i> sp. <i>Cryptomonas tetrapyrenoidosa</i> Skuja
	2.4.2- Tetragonidiaceae	<i>Tetragonidium</i> sp.
2.5- Dinophyceae	2.5.1- Ceratiaceae	<i>Ceratium cornutum</i> (Ehrenberg) Claparède & J.Lachmann <i>Ceratium</i> sp
	2.5.1- Desmomastigaceae	<i>Desmomastix globosa</i> Pascher
	2.5.2- Dinophysaceae	<i>Dinophysis sacculus</i> Stein <i>Dinophysis acuta</i> Ehrenberg <i>Gymnodinium catenatum</i> H.W.Graham <i>Gymnodinium</i> sp. <i>Diplopsalis acuta</i> (Apstein) Entz <i>Thompsodinium</i> sp
	2.5.3- Glenodiniaceae	<i>Glenodiniopsis steinii</i> (Lemmermann) Woloszynska <i>Peridiniopsis borgei</i> Lemmermann <i>Peridiniopsis dinobryonis</i> (Woloszynska) Bourrelly

Annexes Contd.

		<i>Peridiniopsis elpatiewsky</i> (Ostenfeld) Bourrelly
		<i>Peridiniopsis</i> sp.
	2.5.4- Goniodomataceae	<i>Pyrodinium</i> sp.
	2.5.5- Gymnodiniaceae	<i>Gyrodinium</i> sp.
		<i>Amphidinium</i> sp.
	2.5.6- Peridinaceae	<i>Peridinium globulum</i> (Stein) Balech
		<i>Peridinium</i> sp.
		<i>Peridinium thompsonii</i> (Thompson) Bourrelly
	2.5.7- Phytodiniaceae	<i>Spondilosium</i> sp.
		<i>Phytodinium</i> sp.
		<i>Hypnodinium sphaericum</i> Klebs
	2.5.8- Prorocentraceae	<i>Prorocentrum</i> sp.
		<i>Exuviaella compressa</i> (Bailey) Ostenfeld
		<i>Prorocentrum micans</i> Ehrenberg
	2.5.9- Thaumatomastigaceae	<i>Hyaloselene compressa</i> Skuja
2.6- Fragilariophyceae	2.6.1- Fragilariaceae	<i>Asterionella formosa</i> Hassall
		<i>Asterionella japonica</i> Cleve
		<i>Asterionella</i> sp.
		<i>Ceratoneis arcus</i> (Ehrenberg) Kützing
		<i>Diatoma hiemale</i> (Lyngb.) Heib.
		<i>Diatoma</i> sp.
		<i>Diatoma vulgare</i> f. breve (Grunow) Bukhtiyarova
		<i>Fragilaria capucina</i> Desmazières
		<i>Fragilaria crotonensis</i> Kitton
		<i>Fragilaria crotonensis</i> Kitton
		<i>Fragilaria oceanica</i> Cleve
		<i>Fragilaria pinnata</i> Kitton
		<i>Fragilaria</i> sp.
		<i>Fragilaria ulna</i> Kitton
		<i>Fragilaria virescens</i> Ralfs
		<i>Synedra gaillonii</i> (Bory de Saint-Vincent) Ehrenberg
		<i>Synedra pulchella</i> (Ralfs ex Kützing) Kützing
		<i>Synedra</i> sp.
		<i>Thalassionema nitzschioides</i> (Grunow) Mereschkowsky
	2.6.2- Striatellaceae	<i>Striatella</i> sp.
	2.6.7- Tabellariaceae	<i>Tabellaria</i> sp.
		<i>Tabellaria fenestrata</i> (Lyngbye) Kützing
		<i>Tetracyclus rupestris</i> (Braun) Grunow
2.7- Raphidophyceae	2.7.1- Vacuolariaceae	<i>Vacuolaria virescens</i> Cienkow.
2.8- Synurophyceae	2.8.1- Cloramoebaceae	<i>Chlorokardion pleurochloron</i> Pascher
	2.8.2- Mallomonadaceae	<i>Mallomonas acaroides</i> Perty
		<i>Mallomonas reginae</i> Teil.
		<i>Mallomonas</i> sp.
		<i>Synura</i> sp.
2.9- Xanthophyceae	2.9.1- Centritactaceae	<i>Centritractus belanophorus</i> Lemm.
	2.9.2- Characidiopsidaceae	<i>Characidiopsis falx</i> Pascher et Ettl
		<i>Characidiopsis acuta</i> A. Pascher
		<i>Chlorokoryne</i> sp.
	2.9.3- Chloramoebaceae	<i>Thalassiosira fluviatilis</i> Cleve
		<i>Asterogloea</i> sp.
	2.9.4- Halosphaeraceae	<i>Halosphaeropsis viridi</i> Chadefaud
	2.9.5- Ophiocytiaceae	<i>Ophiocytium majus</i> Nägeli

Annexes Contd.

	2.9.6- Pleurochloridaceae	<i>Diachros pleiochloris</i> Pasch. <i>Goniochloris fallax</i> Fott <i>Goniochloris pseudogigas</i> (Bourrelly) Bourrelly <i>Pleurochloridella vacuolata</i> Pascher <i>Pleurogaster lunaris</i> Pascher
	2.9.7- Tribonemataceae	<i>Tribonema vulgare</i> Pascher
	2.9.8- Vaucheriaceae	<i>Vaucheria</i> sp.
III- Cyanophyta		
3.1- Cyanophyceae	3.1.1- Borziaceae	<i>Borzia trilocularis</i> Cohn ex Gomont <i>Sinaiella</i> sp.
	3.1.2- Chamaesiphonaceae	<i>Chamaesiphon curvatus</i> Nordst.
	3.1.3- Chroococcaceae	<i>Chroococcus dispersus</i> (Keissler) Lemmermann <i>Chroococcus limneticus</i> Lemmermann <i>Chroococcus minutus</i> (Kützing) Nägeli <i>Chroococcus</i> sp. <i>Chroococcus turgidus</i> (Kütz.) Nägeli
	3.1.4- Cyanobacteriaceae	<i>Aphanothece nidulans</i> Richter <i>Aphanothece saxicola</i> Nägeli
	3.1.5- Dermocarpellaceae	<i>Dermocarpa kernerii</i> (Hansgirg) Hansgirg
	3.1.6- Entophysalidaceae	<i>Chlorogloea</i> sp. <i>Chlorogloea fasciculata</i> (Ercegovic) Bourrelly. <i>Chlorogloea microcystoides</i> Geitler
	3.1.7- Gomontiellaceae	<i>Crinalium endophyticum</i> Crow
	3.1.8- Gomphosphaeriaceae	<i>Gomphosphaeria</i> sp. <i>Coelomoron pusillum</i> (Van Goor) Komárek
	3.1.9- Hapalosiphonaceae	<i>Loefgrenia anomala</i> Gomont
	3.1.10- Hydrococcaceae	<i>Hydrococcus rivularis</i> Kützing
	3.1.11- Mastigocladopsidaceae	<i>Mastigocladopsis jogensis</i> Iyengar et Desikachary
	3.1.12- Merismopediaceae	<i>Eucapsis alpina</i> Clements & Schantz <i>Lithococcus</i> sp. <i>Merismopedia convoluta</i> Brébisson ex Kützing <i>Merismopedia elegans</i> Braun. <i>Merismopedia glauca</i> (Ehrenberg) Kützing <i>Merismopedia punctata</i> Meyen f. <i>Merismopedia</i> sp. <i>Synechocystis aquatilis</i> Sauv. <i>Synechocystis crassa</i> var. <i>major</i> Geitler <i>Synechocystis diplococcus</i> (Pringsheim) Bourrelly <i>Synechocystis</i> sp.
	3.1.13- Microchaetaceae	<i>Anacystis</i> sp. <i>Microchaete</i> sp. <i>Microcoleus acutissimus</i> N.L.Gardner <i>Microcoleus lacustris</i> (Rabenhorst) Farlow ex Gomont <i>Microcoleus</i> sp. <i>Microcoleus vaginatus</i> Gomont ex Gomont <i>Microcystis aeruginosa</i> (Kützing) Kützing <i>Microcystis biformis</i> (A. Brown) Bourrelly <i>Microcystis elachista</i> (W. West & G. S. West) Compere <i>Microcystis incerta</i> (Lemmermann) Lemmermann <i>Microcystis robusta</i> (H.W.Clark) Nygaard <i>Microcystis viridis</i> (A.Braun) Lemmermann <i>Microcystis wesenbergii</i> West.

Annexes Contd.

3.1.14- Nostocaceae

Anabaena affinis Lemm.
Anabaena flos-aquae Lemm.
Anabaena oscillarioides Bory ex Bornet & Flahault
Anabaena sp.
Anabaena sphaerica Bornet & Flahault
Anabaena spiroides Lemm.
Anabaenopsis circularis (G.S.West) Woloszynska & V.Miller
 in V.Miller
Anabaenopsis sp.
Anabaenopsis tanganyikae (G.S.West) Woloszynska &
 V.V.Miller
Cylindrospermopsis raciborskii (Woloszynska) Seenayya &
 Subba Raju
Cylindrospermopsis sp.
Isocystis messianensis Borzi.
Isocystis planctonica Starmach
Isocystis sp.
Nodularia sp.
Nodularia spumigena Mertens ex Bornet & Flahault
Nostoc flosaquae (Linnaeus) Lyngbye
Nostoc parmelioides Kützing ex Bornet & Flahault
Nostoc piscinale Kützing ex Bornet & Flahault
Ophiocytium capitatum Wolle
Peroniopsis sp.

3.1.15- Nostochopsaceae**3.1.16- Nostochopsidaceae****3.1.17- Oscillatoriaceae**

Mastigocoleus sp.
Nostochopsis lobatus Wood
Lyngbya birgei G.M.Smith
Lyngbya bourrelyana Compère
Lyngbya cebennensis (Gomont) Compère
Lyngbya majuscula Harvey ex Gomont
Lyngbya muralis (Dillwyn) C.Agardh
Lyngbya putealis Montagne ex Gomont
Lyngbya rigidula Hansgirg.
Lyngbya sp.
Oscillatoria amphibia Agardh
Oscillatoria limosa Gom.
Oscillatoria tenuis Agardh ex Gomont.[J].Toxicon
Oscillatoria acuminata Gom.
Oscillatoria agardhii Gomont
Oscillatoria anguinis Gomont
Oscillatoria beggiatoiformis Gomont
Oscillatoria formosa Bory de Saint-Vincent ex Gomont
Oscillatoria jenniferi Gray
Oscillatoria labyrinthiformis Menegh
Oscillatoria lacustris Klebahn.
Oscillatoria margaritifera Kützing ex Gomont
Oscillatoria nigroviridis Thwaita ex Gomont
Oscillatoria okeni Agardh
Oscillatoria ornata (Kützing) Gomont
Oscillatoria platensis Nordst.
Oscillatoria princeps Vaucher.
Oscillatoria rubescens De Cand.

Annexes Contd.

		<i>Oscillatoria sancta</i> Kützing ex Gomont
		<i>Oscillatoria</i> sp.
		<i>Oscillatoria tenuis</i> Ag.
		<i>Oscillatoria terebriformis</i> C.Agardh ex Gomont
		<i>Plectonema malayense</i> Biswas
		<i>Plectonema purpueum</i> Gomont
		<i>Plectonema</i> sp.
		<i>Rhizosolenia eriensis</i> H.L.Smith
		<i>Rhizosolenia longiseta</i> O.Zacharias
		<i>Rhizosolenia setigera</i> Brightwell
		<i>Ammatoidea</i> sp.
		<i>Phormidium autumnale</i> Kützing ex Gomont
		<i>Phormidium luridum</i> (Kützing) Gomont
		<i>Phormidium chalybeum</i> (Mertens ex Gomont) Anagnostidis & Komárek
		<i>Phormidium formosum</i> (Bory de Saint-Vincent ex Gomont) Anagnostidis & Komárek
		<i>Phormidium hamelii</i> (Frémy) Anagnostidis & Komárek
		<i>Phormidium ornatum</i> (Kützing ex Gomont) Anagnostidis & Komárek
		<i>Phormidium</i> sp.
		<i>Phormidium tenue</i> Anagnostidis & Komárek
		<i>Planktolyngbya limnetica</i> (Lemm.) J.Komárk-Legnerová & G.Cronberg
		<i>Schizothrix</i> sp.
		<i>Pseudanabaena catenata</i> Lauterborn
		<i>Pseudanabaena</i> sp.
		<i>Calothrix braunii</i> Bornet and Flahault
		<i>Calothrix gypsophila</i> (Kütz.) Thuret
		<i>Gloeotrichia echinulata</i> P.Richter
		<i>Gloeotrichia</i> sp.
		<i>Rivularia aquatica</i> De Wildeman
		<i>Tolypothrix roberti-lamii</i> Bourrelly in Bourrelly & Manguin.
		<i>Spirulina gigantea</i> Schmidle
		<i>Spirulina maxima</i> Setch.
		<i>Iyengariella tirupatiensis</i> Desikachary
		<i>Synechococcus vantieghemi</i> Pringsheim
		<i>Synechococcus nidulans</i> Lagerh.
		<i>Synechococcus leopoliensis</i> (Raciborski) Komárek
		<i>Synechococcus linearis</i> (Schmidle & Lauterborn) Komárek
		<i>Synechococcus major</i> f. <i>crassior</i> Lagerheim
		<i>Synechococcus</i> sp.
		<i>Synechococcus aeruginosa</i> Nägeli
IV- Euglenophyta		
4.1- Euglenophyceae	4.1.1- Astasiaceae	<i>Distigma</i> sp
		<i>Gyropaigne lefevrei</i> Bourrelly & Georges
		<i>Rhabdomonas incurva</i> Fresenius
		<i>Rhabdomonas</i> sp.
		<i>Rhabdomonas tortuosum</i> (Stockes)
		<i>Sphenomonas</i> sp.
	4.1.2- Euglenaceae	<i>Cryptoglena pigra</i> Ehrenberg
		<i>Euglena acus</i> Ehrbg.

Annexes Contd.

Euglena allorgei Deflandre
Euglena deses Ehrenberg
Euglena granulata (G.A. Klebs) F. Schmitz
Euglena limnophila Lemm.
Euglena oxyuris Schmarda
Euglena pisciformis Klebs.
Euglena polymorpha P.A. Dangeard
Euglena proxima Dang.
Euglena sanguinea Ehrbg.
Euglena sp.
Euglena spirogyra Ehrenberg
Euglena texta (Dujardin) Hübner
Euglena tripteris (Dujardin) G.A. Klebs.
Euglena variabilis G.A. Klebs
Euglena viridis (O.F. Müller) Ehrenberg
Rhynchopus sp.
Strombomonas acuminata (Schmarda) Deflandre
Strombomonas conica V. Conforti & G.-J. Joo.
Strombomonas cylindrica V. Conforti & G.-J. Joo.
Strombomonas gibberosa (Playfair) Deflandre
Strombomonas lanceolata (Playfair) Deflandre
Strombomonas sp.
Strombomonas subcurvata (Proskina-Lavrenko) Deflandre
Strombomonas tambowika (Svirenko) Deflandre
Strombomonas verrucosa (Daday) Deflandre
Trachelomonas abrupta Svirenko
Trachelomonas armata (Ehrenberg) F. Stein
Trachelomonas bacillifera var. minima Playfair
Trachelomonas bernardimensis Vischer emend. Deflandre
Trachelomonas bulla F. Stein ex Deflandre
Trachelomonas caudata (Ehrenberg) Stein
Trachelomonas conica Playfair
Trachelomonas cylindrica Ehrbg.
Trachelomonas globularis (Awer.) Lemmermann
Trachelomonas hexangulata Svirenko
Trachelomonas hispida Lemm.
Trachelomonas kelloggi var. *coronata* Skvortzov
Trachelomonas klebsii Deflandre
Trachelomonas lefevrei Deflandre
Trachelomonas naviculiformis Deflandre
Trachelomonas oblonga Lemmermann
Trachelomonas obovata Stokes.
Trachelomonas rugulosa F. Stein ex Deflandre
Trachelomonas similis A. Stokes
Trachelomonas sinensis Skvortzov
Trachelomonas sp.
Trachelomonas stokesiana Palmer
Trachelomonas superba Svirenko
Trachelomonas verrucosa A. Stokes
Trachelomonas volvocina (Ehrenberg) Ehrenberg
Trachelomonas volvocinopsis Svirenko
Trachelomonas zebra (EHR.) KUTZ

Annexes Contd.

	4.1.3- Eutreptiaceae	<i>Eutreptia thiophila</i> Skuja
	4.1.4- Glenodiniopsidaceae	<i>Sphaerodinium polonicum</i> Wołoszynska
	4.1.5- Peranemataceae	<i>Peranema tortuosum</i> (Christen).
	4.1.6- Petalomonadaceae	<i>Dylakosoma pelophilum</i> Skuja
	4.1.7- Phacaceae	<i>Lepocinclis acuminatum</i> Deflandre
		<i>Lepocinclis caudata</i> A.M. Cunha
		<i>Lepocinclis colligera</i> Deflandre
		<i>Lepocinclis fusiformis</i> (H.J.Carter) Lemmermann
		<i>Lepocinclis marsonii</i> Lemm. Waikato R., Mercer (T).
		<i>Lepocinclis ovum</i> Lemm.
		<i>Lepocinclis</i> sp.
		<i>Lepocinclis stenii</i> Lemm.
		<i>Lepocinclis texta</i> (Dujardin) Lemmermann.
		<i>Phacus acuminatus</i> Stokes
		<i>Phacus agilis</i> Skja.
		<i>Phacus applanatus</i> Poch
		<i>Phacus caudatus</i> Hübner
		<i>Phacus ephipion</i> Ehrbg.
		<i>Phacus gamsii</i> Bourrelly
		<i>Phacus inflexus</i> Conard
		<i>Phacus longicauda</i> (Ehr.) Dujardin
		<i>Phacus mentaweiensis</i> Conrad
		<i>Phacus meson</i> Ehrbg.
		<i>Phacus minutus</i> (Playfair) Pochmann.
		<i>Phacus onyx</i> Pochmann
		<i>Phacus orbicularis</i> Hübn.
		<i>Phacus oscillans</i> Klebs
		<i>Phacus pulcher</i> Y.V.Roll
		<i>Phacus</i> sp.
		<i>Phacus tortuosum</i> (Lemmermann) Skvortzov
		<i>Phacus tortus</i> (Lemmermann) Skvortzov
V- Rhodophyta		
5.1- Florideophyceae	4.1.1- Wrangeliaceae	<i>Ptilothamnion richardsii</i> Skuja
	4.1.2- Rhodomelaceae	<i>Bostrychia scorpioides</i> (Hudson) Montagne
	4.1.3- Caulacanthaceae	<i>Sterrocladia amnica</i> (Montagne) F.Schmitz
5.2- Rhodophyceae	4.1.5- Acrochaetiaceae	<i>Andouinella violacea</i> (Kütz.)
5.3- Stylonematophyceae	4.1.6- Stylonemataceae	<i>Chroodactylon</i> sp.
