

Survey on the Diversity of Species Composition of Phytoplankton at Bung Binh Thien

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ABSTRACT

Bung Binh Thien is considered a natural wetland conservation area in the Mekong Delta, Vietnam with a diverse flora and fauna ecosystem. The survey on phytoplankton composition here was conducted in the dry season of 2019. The results obtained 140 phytoplankton species belonging to 5 algae phylums. Of which, 54 species belong to Chlorophyta, 37 species of Bacillariophyta, Cyanophyta and Euglenophyta, respectively, have 27 and 20 species, and lastly, Dinophyta has 2 species.

Key words : Phytoplankton, Phytoplankton diversity, Vietnam

Introduction

Bung Binh Thien (BBT) is a wetland conservation area, a natural freshwater ecosystem with an area of about 200 hectares in the dry season and expanded to 800 hectares in the flood season, located in the upstream area of An Phu district of An Giang province, Vietnam (An Giang Department of Natural Resources and Environment, 2012). Previously in the BBT area, 124 species of floating plants, 61 species of zooplankton, and 18 species of invertebrates and 111 fish species - including 6 rare species listed in the Vietnam Red Book and IUCN Red List at different threatened levels were identified (Thai Ngoc Tri *et al.*, 2012). However, biodiversity at BBT needs to be re-evaluated along with local socio-economic development.

On the other hand, in recent years, in addition to natural sedimentation plus human impact, the BBT now only receives water from the Binh Di River (the

first part of the lake), making the water inside Bung always stagnant. This leads to the water source in Bung becoming increasingly polluted, the diversity of aquatic resources at risk of being affected, and the decline in the functions of the Bung Binh Thien wetland (Le Cong Quyen, 2015).

Therefore, conducting a survey on the diversity of species composition of phytoplankton here is considered urgent, the topic "Surveying the diversity of species composition of phytoplankton at Bung Binh Thien" is conducted on the basis of the above.

Method

Aquatic plants will be sampled along a circular route along the Bung Binh Thien bed, at 10 selected locations (the survey route around Bung has a total length of 14km, divided into 2km each).

Determine the coordinates of the sampling location: Using a handheld GPS device to determine the coordinates of the sampling points to serve the con-

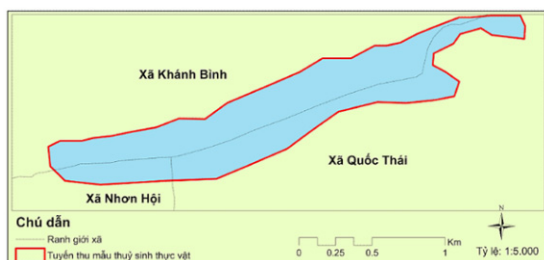


Fig. 1. Map of sampling route for aquatic plants and animals.

struction of a map of plant distribution in the study area.

Identification and enumeration: All collected plant species were processed and analyzed to determine their scientific names by morphological comparison method and based on some relevant documents such as: Vietnamese herbs Southern volume I.II.III (Pham Hoang Ho, 1999); List of plant species in Vietnam (Nguyen Tien Ban, 2003 - 2005). The

plant list was prepared based on the list of tree names identified in the study area.

Results and Discussion

Qualitative analysis of phytoplankton

Through the research results, we have detected 140 species belonging to 5 phylums including cyanobacteria (Cyanophyta), green algae (Chlorophyta), Euglenophyta, Bacillariophyta and Dinophyta. In which, the phylum Chlorophyta predominates with 54 species, followed by Bacillariophyta with 37 species, Cyanophyta and Euglenophyta with 27 and 20 species, respectively, and finally, Dinophyta with only 2 species. Species composition is shown in detail in Table 1.

Two phyla Chlorophyta and Bacillariophyta still dominate in Bung Binh Thien. The variation in the number of species depends on the time of sampling and the content of nutrients, especially nitrogen and phosphorus, in the water body.

Table 1. Phytoplankton species composition at Bung Binh Thien

No	Species	Genus	Family	Order	Class
CYANOBACTERIA					
1	<i>Anabaena affinis</i>	<i>Anabaena</i>	Nostocaceae	Nostocales	Cyanophyceae
2	<i>Anabaena sp.</i>				
3	<i>Anabaena macrospora</i>				
4	<i>Aphanocapsa sp.</i>	<i>Aphanocapsa</i>	Merismopediaceae	Synechococcales	
5	<i>Coelosphaeriumkutzingianum</i>	<i>Coelosphaerium</i>	Merismopediaceae	Synechococcales	
6	<i>Chroococcus giganteus</i>	<i>Chroococcus</i>	Chroococcaceae		
7	<i>Lyngbyabirgei</i>	<i>Lyngbya</i>	Oscillatoriaceae	Oscillatoriales	
8	<i>Lyngbya contorta</i>				
9	<i>Lyngbyamajuscula</i>				
10	<i>Merismopedia elegans</i>	<i>Merismopedia</i>	Merismopediaceae	Synechococcales	
11	<i>Microcystis aeruginosa</i>	<i>Microcystis</i>	Microcystaceae	Chroococcales	
12	<i>Microcystis wesenbergii</i>				
13	<i>Oscillatoria rupilola</i>	<i>Oscillatoria</i>	Oscillatoriaceae	Oscillatoriales	
14	<i>Oscillatoria brevis</i>				
15	<i>Oscillatoria formosa</i>				
16	<i>Oscillatoria limosa</i>				
17	<i>Oscillatoria migra</i>				
18	<i>Oscillatoria mougeotii</i>				
19	<i>Oscillatoria muticola</i>				
20	<i>Oscillatoria princeps</i>				
21	<i>Oscillatoria prolifica</i>				
22	<i>Oscillatoria rubescens</i>				
23	<i>Oscillatoria terebriformis</i>				
24	<i>Plectonatomasiniiana</i>	<i>Plectonema</i>	Oscillatoriaceae	Oscillatoriales	
25	<i>Phormidium tenue</i>	<i>Phormidium</i>	Oscillatoriaceae	Oscillatoriales	
26	<i>Spirulina platensis</i>	<i>Spirulina</i>	Spirulinaceae	Spirulinales	
27	<i>Synechocystisaquatilis</i>	<i>Synechocystis</i>	Merismopediaceae	Synechococcales	Chroococcales

Table 1. Continued ...

No	Species	Genus	Family	Order	Class
CHLOROPHYTA					
28	<i>Actinastrumhantzschii</i>	<i>Actinastrum</i>	Chlorellaceae	Chlorellales	Trebouxiophyceae
29	<i>Ankistrodesmusangustus</i>	<i>Ankistrodesmus</i>	Selenastraceae	Sphaeropleales	Chlorophyceae
30	<i>Characiumobtusum</i>	<i>Characium</i>	Characiaceae	Sphaeropleales	Chlorophyceae
31	<i>Chlorella</i> sp.	<i>Chlorella</i>	Chlorellaceae	Chlorellales	Trebouxiophyceae
32	<i>Chlorococcumhumicola</i>	<i>Chlorococcum</i>	Chlorococcaceae	Chlorococcales	Chlorophyceae
33	<i>Closterium gracile</i>	<i>Closterium</i>	Closteriaceae	Desmidiales	Zygnematophyceae
34	<i>Closterium lineatum</i>				
35	<i>Closterium porrectum</i>				
36	<i>Coelastrummicrosporum</i>	<i>Coelastrum</i>	Scenedesmaceae	Sphaeropleales	Chlorophyceae
37	<i>Coenocystissubcylindrica</i>	<i>Coenocystis</i>	Radiococcaceae	Sphaeropleales	Chlorophyceae
38	<i>Crucigenia quadrata</i>	<i>Crucigenia</i>			Trebouxiophyceae
39	<i>Crucigeniarectangularis</i>				
40	<i>Dictyosphaeriumpulchellum</i>	<i>Dictyosphaerium</i>	Chlorellaceae	Chlorellales	Trebouxiophyceae
41	<i>Eudorina elegans</i>	<i>Eudorina</i>	Volvocaceae	Chlamydomonadales	Chlorophyceae
42	<i>Eudorinaunicocca</i>				
43	<i>Gonium formosum</i>	<i>Gonium</i>	Goniaceae	Chlamydomonadales	Chlorophyceae
44	<i>Micractiniumpusillum</i>	<i>Micractinium</i>	Chlorellaceae	Chlorellales	Trebouxiophyceae
45	<i>Mougeotiascalaris</i>	<i>Mougeotia</i>	Zygnemataceae	Zygnematales	
	<i>Conjugatophyceae</i>				
46	<i>Mougeotiopsiscalospora</i>	<i>Mougeotiopsis</i>	Zygnemataceae	Zygnematales	Zygnematophyceae
47	<i>Oocystidiumovale</i> var. <i>ovale</i>	<i>Oocystidium</i>	Oocystaceae	Chlorellales	Trebouxiophyceae
48	<i>Oocystisborgei</i>	<i>Oocystis</i>	Oocystaceae	Chlorellales	Trebouxiophyceae
49	<i>Pachycladonumbrinus</i>	<i>Pachycladon</i>	Oocystaceae	Chlorellales	Trebouxiophyceae
50	<i>Pandorina morum</i>	<i>Pandorina</i>	Volvocaceae	Chlamydomonadales	Chlorophyceae
51	<i>Pediastrum biradiatum</i>	<i>Pediastrum</i>	Hydrodictyaceae	Sphaeropleales	Chlorophyceae
52	<i>Pediastrum biradiatum</i> var. <i>longecornutum</i>				
53	<i>Pediastrum duplex</i> var. <i>danubiale</i>				
54	<i>Pediastrum duplex</i>				
55	<i>Pediastrum simplex</i>				
56	<i>Pediastrum simplex</i> var. <i>duodenarium</i>				
57	<i>Pediastrum</i> sp.				
58	<i>Pediastrum tetras</i> var. <i>tetraodon</i>				
59	<i>Pleodorina californica</i>	<i>Pleodorina</i>	Volvocaceae	Chlamydomonadales	Chlorophyceae
60	<i>Scenedesbijugatus</i>	<i>Scenedes</i>	Scenedesmaceae	Sphaeropleales	Chlorophyceae
61	<i>Scenedesdimorphus</i>				
62	<i>Scenedesquadricauda</i> var. <i>longispina</i>				
63	<i>Scenedesmus acuminatus</i> var. <i>biseratus</i>	<i>Scenedesmus</i>	Scenedesmaceae	Sphaeropleales	Chlorophyceae
64	<i>Scenedesmus acuminatus</i> var. <i>elongatus</i>				
65	<i>Scenedesmus denticulatus</i> var. <i>linearis</i>				
66	<i>Scenedesmus obliquus</i> (8tb xen k?)				
67	<i>Scenedesmus quadricauda</i>				
68	<i>Scenedesmus</i> sp.				
69	<i>Selenastrum gracile</i>	<i>Selenastrum</i>	Selenastraceae	Sphaeropleales	Chlorophyceae

Table 1. Continued ...

No	Species	Genus	Family	Order	Class
70	<i>Sphaerocystisschroeteri</i>	<i>Sphaerocystis</i>	Palmellaceae	Tetrasporales	Chlorophyceae
71	<i>Spirogyra azygospora</i>	<i>Spirogyra</i>	Zygnemataceae	Zygnematales	Zygnematophyceae
72	<i>Spirogyra prolifica</i>				
73	<i>Staurastrumcuspidatum</i>	<i>Staurastrum</i>	Desmidiaceae	Desmidiales	Zygnematophyceae
74	<i>Staurastrumchaetoceras</i>				
75	<i>Staurastrummegacanthum</i> var. <i>kalimantanum</i>				
76	<i>Tetraedronhastatum</i>	<i>Tetraedron</i>	Hydrodictyaceae	Sphaeropleales	Chlorophyceae
77	<i>Tetraedronlobatum</i> var. <i>lobatum</i>				
78	<i>Tetraedronlobatum</i> var. <i>polyfurcatum</i>				
79	<i>Tetraedronlobatum</i> var. <i>subtetraedricum</i>				
80	<i>Treubariacrassispina</i>	<i>Treubaria</i>	Treubariaceae	Sphaeropleales	Chlorophyceae
81	<i>Volvox aureus</i>	<i>Volvox</i>	Volvocaceae	Chlamydomonadales	Chlorophyceae
EUGLENOPHYTA					
82	<i>Euglena minima</i>	<i>Euglena</i>	Euglenaceae	Euglenida	Euglenoidea
83	<i>Euglena oxyuris</i>				
84	<i>Euglena proxima</i>				
85	<i>Euglena rostriferan.sp.</i>				
86	<i>Gonyostomum semen</i>	<i>Gonyostomum</i>	Vacuolariaceae	Raphidomonadales	Raphidophyceae
87	<i>Lepocinclis ovum</i>	<i>Lepocinclis</i>	Phacaceae	Euglenida	Euglenoidea
88	<i>Monomorphinapyrum</i>	<i>Monomorphina</i>	Euglenidae	Euglenida	Euglenophyceae
89	<i>Phacusalatus</i>	<i>Phacus</i>	Phacaceae	Euglenida	Euglenoidea
90	<i>Phacusanomalus</i>				
91	<i>Phacuscontortus</i>				
92	<i>Phaculongiauda</i>				
93	<i>Phacus ovalis</i>				
94	<i>Phacupleuronectes</i>				
95	<i>Phacustortus</i>				
96	<i>Strombomonasgibberosa</i>	<i>Strombomonas</i>	Euglenidae	Euglenida	Euglenophyceae
97	<i>Strombomonas</i> sp.				
98	<i>Trachelomonasarmata</i>	<i>Trachelomonas</i>	Euglenaceae	Euglenales	Euglenoidea
99	<i>Trachelomonashispida</i>				
100	<i>Trachelomonaslagenella</i>				
101	<i>Trachelomonasvolvocina</i>				
BACILLARIOPHYTA					
102	<i>Amphiprora gigantea</i>	<i>Amphiprora</i>	Amphipleuraceae	Naviculales	Bacillariophyceae
103	<i>Cocconeisplacentula</i>	<i>Cocconeis</i>	Cocconeidaceae	Achnanthes	Bacillariophyceae
104	<i>Coscinodiscus asteromphalus</i>	<i>Coscinodiscus</i>	Coscinodiscaceae	Coscinodiscales	Coscinodiscophyceae
105	<i>Coscinodiscus granii</i>				
106	<i>Coscinodiscus radiatus</i>				
107	<i>Coscinodiscus radiatus.</i>				
108	<i>Cyclotella comta</i>	<i>Cyclotella</i>	Stephanodiscaceae	Thalassiosirales	Bacillariophyceae
109	<i>Cyclotella meneghiniana</i>				
110	<i>Cymbellanaoiculiformis</i>	<i>Cymbella</i>	Cymbellaceae	Cymbellales	Bacillariophyceae
111	<i>Cymbella</i> sp.				
112	<i>Cymbellatumida</i>				
113	<i>Diatomaelongatum</i>	<i>Diatoma</i>	Fragilariaceae	Fragilariales	Bacillariophyceae
114	<i>Fragilaria</i> sp.	<i>Fragilaria</i>	Fragilariaceae	Fragilariales	Bacillariophyceae
115	<i>Gomphonema</i> sp.	<i>Gomphonema</i>	Gomphonemataceae	Cymbellales	Bacillariophyceae

Table 1. Continued ...

No	Species	Genus	Family	Order	Class
116	<i>Grammatophora serpentina</i>	<i>Grammatophora</i>	Grammatophoraceae	Rhabdonematales	Bacillariophyceae
117	<i>Gyrosigma attenuatum</i>	<i>Gyrosigma</i>	Pleurosigmataceae	Naviculales	Bacillariophyceae
118	<i>Melosiragranulata</i> <i>var. granulata</i>	<i>Melosira</i>	Melosiraceae	Melosirales	Bacillariophyceae
119	<i>Melosira japonica</i>				
120	<i>Melosiragranulata</i> <i>var.</i> <i>angustissima</i> <i>fo. spiralis</i>				
121	<i>Melosiragranulata</i>				
122	<i>Navicula elegans</i>	<i>Navicula</i>	Naviculaceae	Naviculales	Bacillariophyceae
123	<i>Naviculagastrum</i>				
124	<i>Naviculaplacentula</i> <i>fo.</i> <i>latiuscula</i>				
125	<i>Naviculaplacentula</i> <i>fo.</i> <i>lanceolata</i>				
126	<i>Naviculaplacentula</i> <i>form.</i> <i>jensis</i>				
127	<i>Navicularhynchocephala</i>				
128	<i>Navicula</i> sp.				
129	<i>Naviculasubtilissima</i>				
130	<i>Nitzschia acicularis</i>	<i>Nitzschia</i>	Bacillariaceae	Bacillariales	Bacillariophyceae
131	<i>Nitzschia filiformis</i>				
132	<i>Nitzschia paradoxa</i>				
133	<i>Nitzschia reversa</i>				
134	<i>Surirellabiseriata</i>	<i>Surirella</i>	Surirellaceae	Surirellales	Bacillariophyceae
135	<i>Surirellarobusta</i>				
136	<i>Surirellarobusta</i> <i>var. splendida</i>				
137	<i>Synedra ulna</i>	<i>Synedra</i>	Fragilariaceae	Fragilariales	Bacillariophyceae
138	<i>Thalassiosira condensata</i>	<i>Thalassiosira</i>	Thalassiosiraceae	Thalassiosirales	Coscinodiscophyceae
139	<i>Peridinium maciferum</i>	<i>Peridinium</i>	Peridiniaceae	Peridiniales	Dinophyceae
140	<i>Peridinium</i> sp.				

In this study, the composition of Chlorophyta was dominant at all sampling sites, with the most commonly occurring species being *Actinastrum hantzschii*, *Eudorina elegans*, *Eudorina unicocca*, *Pediastrum biradiatum*, *Pediastrum simplex*, *Pleodorina californica*. The locations near the shore have a higher number of species than the rest, due to the influence of food service business activities, poultry raising and activities of coastal households, making water high organic matter and high nutritional salt.

Next is Bacillariophyta with 37 species found. The species *Melosiragranulata var granulata*, *Melosiragranulata var. angustissima fo. spiralis*, *Melosira granulata*, *Surirellabiseriata* occurred in most locations. In which, the three positions at the top and outside of the snap have an outstandingly high number of species. Because most Bacillariophyta are more adapted to brackish water than freshwater,

requiring low nutrient sources, it also partly reflects the difference in salinity as well as nutrient content inside and outside the pond.

There are 27 species of Cyanophyta occurring at the sampling sites, prominent among them are *Anabaena* sp, *Anabaena macrospora*, *Oscillatoria limosa*, *Phormidium tenue*. In particular, the species *Phormidium tenue* occurs a lot in places affected by poultry (duck) cages and activities of coastal households. The number of Cyanophyta species ranges from 6-14 species.

The number of species of Euglenophyta found in the study area is 20 species. In which, *Euglena minima* and *Phacus longiauda* appeared at most of the sampling locations. The presence of *Euglena* and *Phacus* varieties shows that the water here is being polluted by organic matter. The number of species of Euglenophyta increases gradually from the out-

side to the inside of Bung Binh Thien, because the closer to the end, the slower the flow rate, the less water circulates with the outside, so the species composition is richer.

The last is Dinophyta, with only two species of *Peridinium acicuferum* and *Peridinium sp.* The species composition of Dinophyta is less abundant because they are distributed mainly in salt water environment (90%).

Conclusion and suggestions

The composition of phytoplankton in the dry season at Bung Binh Thien is quite diverse with 140 species belonging to 5 phylums of algae. In which, Chlorophyta has 54 species, Bacillariophyta has 37 species, Cyanophyta and Euglenophyta have 27 and 20 species, respectively, and finally, Dinophyta with 2 species were found. Some species have been discovered a lot such as: *Phormidium tenue*, *Phormidium tenue*, *Melosira granulate*, *Peridinium macicuferum*...

Continue to monitor and study the status of biodiversity in order to monitor the change in species composition between the two seasons in the study area and find out the causes affecting the biodiversity change in the study area.

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