STUDY ON SOME PHYTOPLANKTON OF MAUNG MA KAN BEACH, LONGLONE TOWNSHIP, TANINTHARYI REGION, SOUTHERN MYANMAR

Yin Yin Htay[1], Moe Lwin Lwin[2], Tin Tin Kyu[2], Aung Aung Aye[2]

Abstract

Results indicated 47 genera consisted of 88 species of phytoplankton in the samples from Maung Ma Kan water at 2018. Among these, 41 genera was represented by 76 species were diatoms of Bacillariophyta and 6 genera with 12 species were dinoflagellates of Dinoflagellata. In Premonsoon, *Bellerochea horologicalis, Chaetoceros pseudocurvisetum, Proboscia alata, Rhizosolenia robusta* and *Syringidium americanum* dominantly occurred. Among these, the most abundant was *Proboscia alata,* 262 cell/L and it was 15 % of the total abundance of phytoplankton. In Monsoon, *Bacteriastrum varians, Bacteriastrum hyalinum, Lauderia annulata, Thalassionema frauenfeldii* and *Thalassionema nitzschioides* were abundantly recorded. Among these, the most maximum species was *Bacteriastrum varians,* 265 cell/L and it was 17 % of the total abundance of phytoplankton. In Postmonsoon, *Aulacodiscus argus, Bellerochea horologicalis, Palaria sulcata, Proboscia alata* and *Thalassionema nitzschioides* were dominant. Among these, the most dominant species was *Bellerochea horologicalis*, 261 cell/L and it was 43 % of the total abundance of phytoplankton. Moreover, the maximum total abundance was recorded as Premonsoon (1720 cell/L) followed by Monsoon (1518 cell/L) however Postmonsoon (604 cell/L) was observed.

Keywords: Abundance, Monsoon, phytoplankton, Postmonsoon and Premonsoon.

Introduction

Maung Ma Kan beach is Myanmar's second most culturally significant beach after Ngapali. Situated only 12 miles along a well-sealed road from Dawei City the beach is very under developed and primarily servicing the local Dawei residents. It is also situated in Southern Myanmar. And then it is located in front of Mocos Island that is situated in the Andaman Sea. Myanmar has tropical monsoon climate, Myanmar coastal area is influenced by strong monsoon regimes.

Phytoplankton always lives near the surface of the sea because, like all plants, they require light for photosynthesis. Phytoplankton is single-celled organisms, primary producers that serve as the base of the marine food chain. Phytoplankton, as the basis of trophic chain, constitutes the most important biological community in any aquatic system. The species composition and population density of phytoplankton are sensitive to environmental changes.

The objectives of this research: 1) to identify the diatoms and dinoflagellate species from Maung Ma Kan water; 2) to know the phytoplankton diversity in Maung Ma Kan water; 3) to recognize the seasonal variations of species composition and distribution; 4) to observe the seasonal abundance of phytoplankton from Maung Ma Kan water; 5) to understand the seasonal dominant species of phytoplankton community in Maung Ma Kan water during the study period.

[1] Dr , Lecturer, Department of Marine Science, Myeik University
[2] Assistant Lecturer, Department of Marine Science, Myeik University

Materials and Methods

The phytoplankton was collected from Maung Ma Kan water, Longlone Township, Taninthayi Region, Southern Myanmar (Lat. 14º 8.5' N and Long. 98º 4.5' E) at 2018. These samples were seasonal collected with a 10 µm mesh size standard plankton net (2 feet long and 8 inches wide) through 10m in length from a boat for 3 minutes to obtain a sufficient amount of sample for making the species identification. Premonsoon is from March to May; Monsoon is from June to October and Postmonsoon is November to February. The sample was preserved in 2 % formalin/sea water mixture and stored in the Department of Marine Science, Myeik University. And then 3 Liters of water sample were taken for the calculation of species abundance. Some environmental parameters were measured.

Results

A total of 88 species included 47 genera of phytoplankton were recorded. Among these, 76 species were diatoms and 12 species were dinoflagellates (Table. 2). In Premonsoon, *Bellerochea horologicalis* (139 cell/L), *Chaetoceros pseudocurvisetum* (183 cell/L), *Proboscia alata* (262 cell/L), *Rhizosolenia robusta* (151 cell/L) and *Syringidium americanum* (130 cell/L) dominantly occurred among 48 species (Table. 3 and Figure. 3). Therefore the most dominant species was *Proboscia alata* (262 cell/L) and 15 % of total abundance of phytoplankton (Figure. 6). The total abundance (1720 cell/L) was recorded during the study period. One dinoflagellate and forty seven diatoms were recorded during this season. The environmental factors, salinity 32-36‰, temperature 27ºC, pH 7.4, transparency 2.8 m, ammonia nitrogen 0.05 ppm, nitrite nitrogen 0.03 ppm and nitrate nitrogen 0.14 ppm were recorded during the study period (Table. 4).

Figure 1 Map showing the location of sample collection site, Maung Ma Kan water, Longlone Township, Tanintharyi Region, Southern Myanmar.

In Monsoon, *Bacteriastrum varians* (265 cell/L), *Bacteriastrum hyalinum* (147 cell/L), *Lauderia annulata* (146 cell/L), *Thalassionema frauenfeldii* (113 cell/L) and *Thalassionema nitzschioides* (95 cell/L) were abundantly recorded (Table. 3 and Figure. 4). Among these, the most maximum species was *Bacteriastrum varians*, 265 cell/L and 17 % of total abundance of phytoplankton (Figure. 7). The total abundance (1518 cell/L) was recorded during the study period (Table. 1). More dinoflagellate species was recorded in Monsoon than other season. The environmental factors of the Monsoon, salinity 20-30‰, temperature 26ºC, pH 7.2, transparency 2.7 m, ammonia nitrogen 0.07 ppm, nitrite nitrogen 0.04 ppm and nitrate nitrogen 0.15 ppm were

recorded during the study period (Table. 4). A total of 52 species, consisting of 43 diatoms and 9 dinoflagellate species occurred.

In Postmonsoon, *Bellerochea horologicalis* (261 cell/L), *Thalassionema nitzschioides* (47 cell/L), *Proboscia alata* (40 cell/L), *Aulacodiscus argus* and *Palaria sulcata* (25 cell/L) were dominant in the study area (Table. 3 and Figure. 5). Among these, the most dominant species was *Bellerochea horologicalis*, 261 cell/L and it was 43 % of the total abundance of phytoplankton (Figure. 8). Moreover, the maximum total abundance (604 cell/L) was recorded during the study period. Some environmental factors such as salinity 30-40‰, temperature 27 ºC, pH 7.5,

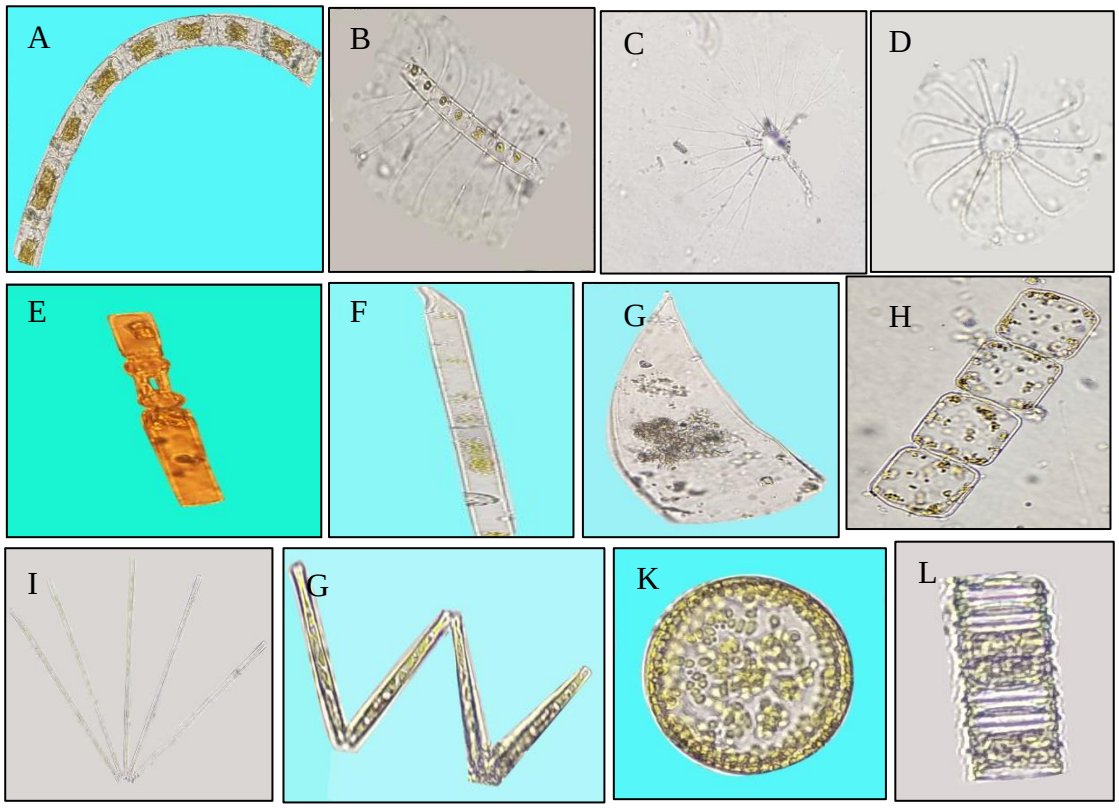

Figure 2 A-L) The dominant species of three seasons during the study period. A) *Bellerochea horologicalis*; B) *Chaetoceros pseudocurvisetum*; (C) *Bacteriastrum hyalinum* Lauder; D) *B. varians* Lauder; E) *Syringidium americanum* Bailey; F) *Proboscia alata* (Brightwell) Sundstrom; G) *Rhizosolenia robusta* Norman ex Pritchard; H) *Lauderia annulata* Cleve; I) *Thalassionema frauenfeldii* (Grumow) Hallegraeff; J) *T. nitzschioides* (Grunow) Mereschkowsky; K) *Aulacodiscus argus* (Ehrenberg) A.Schmidt; L) *Paralia sulcata* (Ehrenberg) Cleve.

transparency 3 m, ammonia nitrogen 0.06 ppm, nitrite nitrogen 0.05 ppm and nitrate nitrogen 0.17 ppm were recorded during the Postmonsoon (Table. 4). A total of 52 species containing 44 diatoms and 8 dinoflagellates were recorded in this season.

Discussion

The phytoplankton community of the study area's water inhabited 88 species consisted of 56 Bacillariophyceae, 20 species of Coscinodiscophyceae, 11 species of Dinophyceae and 1 species of Dictyochophyceae (Table. 2). In the present investigation, the following environmental factors were recorded. Salinity was more in Premonsoon and Postmonsoon than Monsoon. The

temperature changed a little in different three seasons. The most pH (7.5) was recorded in the Postmonsoon. More transparency (3 m) was recorded in Postmonsoon than in Premonsoon and Monsoon. The more ammonia nitrogen 0.07 ppm was recorded in Monsoon than other seasons however the nitrate nitrogen 0.17 ppm and nitrite nitrogen 0.05 ppm were higher in the Postmonsoon than other (Table. 4).

Table 1 Seasonal abundance (cell/L) of phytoplankton at Maung Ma Kan water during 2018

Sr. No	Species	Pre-Monsoon	Monsoon	Post Monsoon
1.	*Aulacoseira epidendron*	1	0	0
2.	*Asterionellopsis glacialis*	1	0	0
3.	*Asteromphalu sheptactis*	0	2	0
4.	*A. cleveanus*	0	2	0
5.	*Aulacodiscus argus*	0	1	25
6.	*Bacteriastrum elongatum*	3	0	0
7.	*B. hyalinum*	0	147	7
8.	*B. varians*	24	265	1
9.	*Bellerochea horologicalis*	139	0	261
10.	*B. reticulata*	0	0	2
11.	*Campylodiscus sp.*	0	0	1
12.	*Chaetoceros peruvianus*	45	6	0
13.	*C. curvisetus*	2	60	2
14.	*C. brevis*	2	3	0
15.	*C. pseudocurvisetum*	183	0	1
16.	*C. lorenzianum*	30	45	0
17.	*C. atlanticus*	1	10	0
18.	*C. subtilis*	0	60	0
19.	*C. pseudocrinitus*	3	0	0
20.	*C. coarctatus*	0	0	1
21.	*C. costatum*	15	0	0
22.	*C. dichaetus*	0	10	0
23.	*C. diversum*	0	33	0
24.	*C. compressus*	0	15	0
25.	*Coscinodiscus radiatus*	21	7	4
26.	*C. granii*	0	6	2
27.	*C. gigas*	0	1	0
28.	*Climacodium frauenfeldianum*	0	2	0
29.	*Ceratiumfusus*	0	0	4
30.	*C. macroceros*	0	1	3
31.	*C. furca*	0	25	2
32.	*Corethron criophilum var. inflatum*	0	13	0
33.	*Cyclotellastriata*	8	5	1
34.	*Cylindrotheca closterium*	0	0	1
35.	*Dinophysis caudata*	0	8	1
36.	*Ditylum sol*	11	85	10
37.	*D. brightwellii*	12	5	0
38.	*Dictyocha fibula*	21	0	0
39.	*Entomoneis alata*	1	1	1
40.	*Eucampia cornuta*	2	0	0

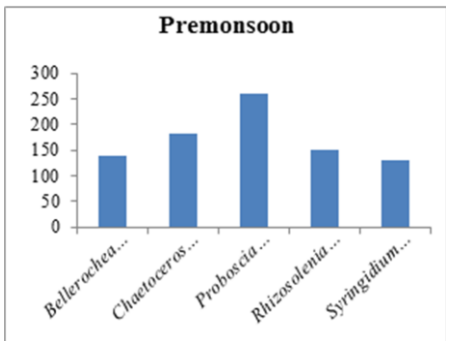

Figure 3 The abundance of dominant species of phytoplankton at Maung Ma Kan water during

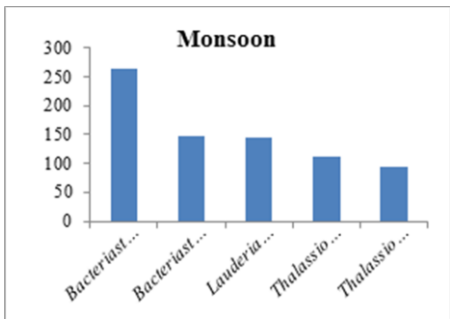

Figure 4 The abundance of dominant species of phytoplankton at Maung Ma Kan water during Monsoon, 2018.

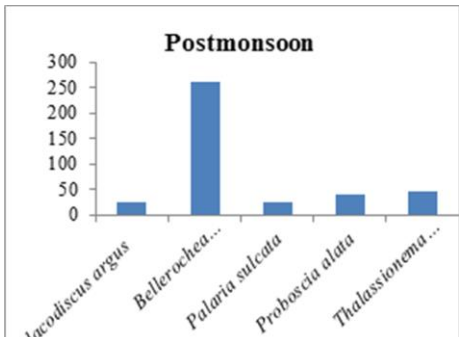

Figure 5 The abundance of dominant species of phytoplankton at Maung Ma Kan water during Postmonsoon,2018.

41.	*E. zodiacus*	0	0	9
42.	*Guinardia flaccida*	14	0	8
43.	*G. striata*	8	65	1
44.	*Gyrosigma balticum var. californicum*	11	0	0
45.	*Helicotheca tamensis*	0	1	7
46.	*Hemiaulus sinensis*	0	36	0
Sr. No	Species	Pre-Mon soon	Mon soon	Post Mon soon
47.	*H. indicus*	1	0	0
48.	*H. hauckii*	0	7	0
49.	*Hemidiscus cuneiformis*	0	12	5
50.	*Lauderia annulata*	47	146	6
51.	*Leptocylindrus danicus*	19	12	0
52.	*Lyrella granulata*	0	0	1
53.	*Meuniera membranacea*	9	0	4
54.	*Minidiscus trioculatus*	0	0	3
55.	*Neoceratium tripos*	0	1	0
56.	*N. breve*	0	0	2
57.	*Nitzschia sigma*	2	0	5
58.	*N. filiformis*	1	0	0
59.	*Odontella mobiliensis*	1	2	13
60.	*O. sinensis*	40	24	23
61.	*O. granulata*	0	0	5
62.	*Palariasulcata*	55	13	25
63.	*Peridinium quinquecorne*	0	1	0
64.	*Protoperidinium oceanicum*	0	37	2
65.	*P. conicum*	0	7	7
66.	*P. depressum*	0	1	0
67.	*Pleurosigma normanii*	40	3	4
68.	*P. elongatum*	5	0	2
69.	*Plantoniella sol*	1	0	0
70.	*Pseudonitzschia lineola*	0	0	2
71.	*P. seriata*	0	6	0
72.	*Prorocentrum micans*	0	4	2
73.	*Proboscia alata*	262	17	40
74.	*P. indica*	11	0	0
75.	*Rhizosolenia calcar. avis*	60	0	8
76.	*R. setigera*	36	16	3
77.	*R. imbricata*	67	10	15
78.	*R. robusta*	151	0	2
79.	*Schroderella delicatula*	70	20	8
80.	*Syringidium americanum*	130	0	0
81.	*Thalassionema frauenfeldii*	13	113	0
82.	*T. nitzschioides*	110	95	47
83.	*xcentricaThalassiosira e*	0	0	1
84.	*T. leptopus*	0	0	9
85.	*T. punctigera*	8	0	1
86.	*T. subtalis*	0	50	0
87.	*Triceratium favus*	12	1	3
88.	*Ulnaria ulna*	11	0	1
	Total	1720	1518	604

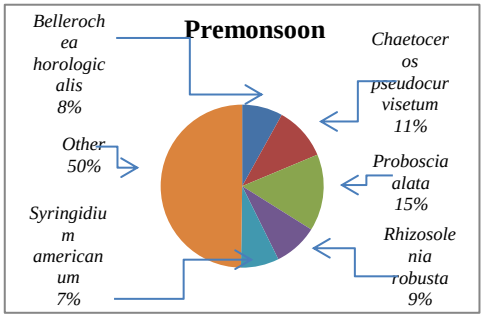

Figure 6 The composition (%) of dominant species at Maung Ma Kan water during Premonsoon, 2018.

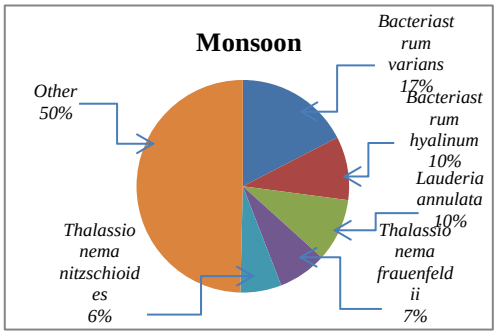

Figure 7 The composition (%) of dominant species at Maung Ma Kan water during Monsoon, 2018.

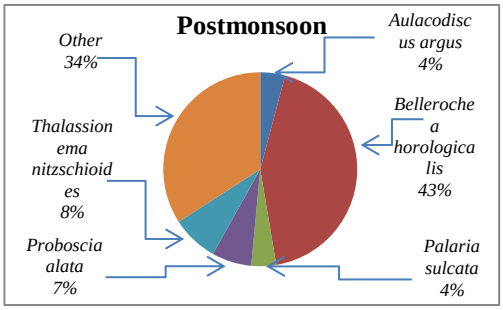

Figure8 The composition (%) of dominant species at Maung Ma Kan water during Postmonsoon, 2018.

Table 2 The presence-absence index of phytoplankton species by three seasons in Maung Ma Kan water during 2018.

Sr. No.	Species	Premonsoon	Monsoon	Postmonsoon
1.	*Aulacoseira epidendron*	+	-	-
2.	*Asterionellopsis glacialis*	+	-	-
3.	*Asteromphalus heptactis*	-	+	-
4.	*A. cleveanus*	-	+	-
5.	*Aulacodiscus argus*	-	+	+
6.	*Bacteriastrum elongatum*	+	-	-
7.	*B. hyalinum*	-	+	+
8.	*B. varians*	+	+	+
9.	*Bellerochea horologicalis*	+	-	+
10.	*B. reticulata*	-	-	+
11.	*Campylodiscus sp.*	-	-	+
12.	*Chaetoceros peruvianus*	+	+	-
13.	*C. curvisetus*	+	+	+
14.	*C. brevis*	+	+	-
15.	*C. pseudocurvisetum*	+	-	+
16.	*C. lorenzianum*	+	+	-
17.	*C. atlanticus*	+	+	-
18.	*C. subtilis*	-	+	-
19.	*C. pseudocrinitus*	+	-	-
20.	*C. coarctatus*	-	-	+
21.	*C. costatum*	+	-	-
22.	*C. dichaetus*	-	+	-
23.	*C.diversum*	-	+	-
24.	*C. compressus*	-	+	-
25.	*Coscinodiscus radiatus*	+	+	+
26.	*C. granii*	-	+	+
27.	*C. gigas*	-	+	-
28.	*Climacodium frauenfeldianum*	-	+	-
29.	*Ceratiumfusus*	-	-	+
30.	*C. macroceros*	-	+	+
31.	*C. furca*	-	+	+
32.	*Corethron criophilum var. inflatum*	-	+	-
33.	*Cyclotella striata*	+	+	+
34.	*Cylindrotheca closterium*	-	-	+
35.	*Dinophysis caudata*	-	+	+
36.	*Ditylum sol*	+	+	+
37.	*D. brightwellii*	+	+	-
38.	*Dictyocha fibula*	+	-	-
39.	*Entomoneis alata*	+	+	+
40.	*Eucampia cornuta*	+	-	-
41.	*E. zodiacus*	-	-	+
42.	*Guinardia flaccida*	+	-	+
43.	*G. striata*	+	+	+
44.	*Gyrosigma balticum var. californicum*	+	-	-
45.	*Helicotheca tamensis*	-	+	+
46.	*Hemiaulus sinensis*	-	+	-
47.	*H. indicus*	+	-	-
48.	*H. hauckii*	-	+	-
49.	*Hemidiscus cuneiformis*	-	+	+
50.	*Lauderia annulata*	+	+	+
51.	*Leptocylindrus danicus*	+	+	-
52.	*Lyrella fogedii*	-	-	+

Table. 2.Continued:

53	*Meuniera membranacea*	+	-	+
53.	*Minidiscus trioculatus*	-	-	+
54.	*Neoceratium tripos*	-	+	-
55.	*N. breve*	-	-	+
56.	*Nitzschia longissima*	+	-	+
57.	*N. angularis*	+	-	-
58.	*Odontella mobiliensis*	+	+	+
59.	*O. sinensis*	+	+	+
60.	*O. granulata*	-	-	+
61.	*Palaria sulcata*	+	+	+
62.	*Peridinium quinquecorne*	-	+	-
63.	*Protoperidinium oceanicum*	-	+	+
64.	*P. conicum*	-	+	+
65.	*P. depressum*	-	+	-
66.	*Pleurosigma normanii*	+	+	+
67.	*P. elongatum*	+	-	+
68.	*Plantoniella sol*	+	-	-
69.	*Pseudonitzschia lineola*	-	-	+
70.	*P. seriata*	-	+	-
71.	*Prorocentrum micans*	-	+	+
72.	*Probosciaalata*	+	+	+
73.	*P. indica*	+	-	-
74.	*Rhizosolenia calcar. avis*	+	-	+
75.	*R. setigera*	+	+	+
76.	*R. imbricata*	+	+	+
77.	*R. robusta*	+	-	+
78.	*Schroderella delicatula*	+	+	+
79.	*Syringidium americanum*	+	-	-
80.	*Thalassionema frauenfeldii*	+	+	-
81.	*T. nitzschioides*	+	+	+
82.	*Thalassiosira excentrica*	-	-	+
83.	*T. leptopus*	-	-	+
84.	*T. punctigera*	+	-	+
85.	*T. subtalis*	-	+	-
86.	*Triceratium favus*	+	+	+
87.	*Ulnaria ulna*	+	-	+
	No. of species	48	52	52

In the present study, the most abundance of phytoplankton 1720 cell/L was recorded in Premonsoon however the lowest one 604 cell/L was observed in Postmonsoon (Table. 1). Forty eight species of phytoplankton distributed in the Premonsoon however 52 species was recorded in the Monsoon and Postmonsoon (Table. 2). Boonyapiwat (1997) described that the greatest phytoplankton bloom occurred by the highest cell density of *Skeletonema costatum* in the Postmonsoon season near the end of Peninsular Malaysia. However *Bellerochea horologicalis* dominantly occurred during the study period.

Table 3 Abundance of dominant phytoplankton species surveyed from Maung Ma Kan water during the study period.

	Premonsoon		**Monsoon**		**Postmonsoon**	
Sr. No.	**Species**	**cell/L**	**Species**	**cell/L**	**Species**	**cell/L**
1	*Proboscia alata*	262	*Bacteriastrum varians*	265	*Bellerochea horologicalis*	261
2	*Chaetoceros pseudocurvisetum*	183	*Bacteriastrum hyalinum*	147	*Thalassionema nitzschioides*	47
3	*Rhizosolenia robusta*	151	*Lauderia annulata*	146	*Proboscia alata*	40
4	*Bellerochea horologicalis*	139	*Thalassionema frauenfeldii*	113	*Palaria sulcata*	25
5	*Syringidium americanum*	130	*Thalassionema nitzschioides*	95	*Aulacodiscus argus*	25

Table 4 The environmental parameters from Maung Ma Kan water during the study period.

Sr. No	**Parameters**	**Premonsoon**	**Monsoon**	**Postmonsoon**
1.	Salinity (‰)	32-36	20-30	30-40
2.	Temperature (ºC)	27	26	27
3.	pH	7.4	7.2	7.5
4.	Transparency (m)	2.8	2.7	3
5.	Ammonia nitrogen (ppm)	0.05	0.07	0.06
6.	Nitrite nitrogen (ppm)	0.03	0.04	0.05
7.	Nitrate nitrogen (ppm)	0.14	0.15	0.17

Rao and Al-Yamani (1998) described 18 species known to be harmful were present from the waters between Shatt Al-Arab and Straits of Hormuz, Arabian Gulf. However a few harmful species occurred in the present study. Ariyadej *et al*. (2004) described *Cyclotella meneghiniana* Kutzing and *Melosira varians* Agardh were indicators from the Banglang Reservoir, Yala Province. However *Cyclotella striata* normally occurred in the present study.

Boonyapiwat *et al*. (2007) recorded that *Proboscia alata* was dominant species in the Bay of Bengal. This result was near similar to the present study. Saravanakumar *et al*. (2008) reported the high densities of phytoplankton in the creek waters of western mangrove of Kachchh-Gujarat during monsoon and early winter season. This result was the same as the present observation. Si Thu Hein (2010) described that *Ceratium sp.* was dominantly found in Pahtaw water and *Ceratium furca* was dominantly observed in the present study.

Khin Yu Nwe (2011) reported *Thalassionema frauenfeldii, T. nitzschioides, Coscinodiscus sp.* and *Chaetoceros sp*. were dominant species in Myeik adjacent waters. These results were the same as the present study. Ogbuagu and Ayoade (2012) observed that seasonal peaking in abundance of phytoplankton could be attributed to periods of concentrations of nutrients from freshwater in Etche, Nigeria. This research was similar to the present study. Su Myat (2013) described that *Lauderia annulata, Bellerochea horologicalis* and *Thalassionema* spp. were commonly detected in Southern Myanmar. These results were similar to the present study.

Kocer and Sen **(**2014**)** *Melosira* sp. and *Meridion circulare* were the dominant taxa of the surface phytoplankton from Lake Hazar, Turkey in March and June, respectively. However *Bellerochea horologicalis, C. pseudocurvisetum, Proboscia alata, Rhizosolenia robusta* and *Syringidium americanum* were dominant in the present study during this period.

The dominant species was variable accordance to the season. In Premonsoon, *Bellerochea horologicalis, Chaetoceros pseudocurvisetum, Proboscia alata, Rhizosolenia robusta* and *Syringidium americanum* were dominantly occurred however in Monsoon, *Bacteriastrum varians, Bacteriastrum hyalinum, Lauderia annulata, Thalassionema frauenfeldii* and *Thalassionema nitzschioides* were abundantly recorded. In Postmonsoon, *Bellerochea horologicalis, Thalassionema nitzschioides, Proboscia alata, Aulacodiscus argus* and *Palaria sulcata* were dominant in the study area (Table. 3) (Figure. 2). Pandiyarajan *et al*. (2014) described that Bacillariophyceae was dominant than other from the inshore waters of Nizampatnam, South East coast of Indian. This result was the same to the present study.

Yin Yin Htay (2014) observed the most abundant species were *Chaetoceros curvisetus, Coscinodiscus radiatus, C. granii, Ditylum sol, Lauderia annulata, Melosira nummuloides, Odontella sinensis, Pleurosigma normanii, Proboscia alata, Pseudonitzschia seriata, Rhizosolenia setigera, Thalassiosira eccentrica, Thalassionema frauenfeldii* and *T. nitzschioides* in Myeik Archipelago. These results were a little similar to the present study however *Bellerochea horologicalis, Bacteriastrum varians* and *Rhizosolenia robusta* were dominantly observed in the present study.

Yin Yin Htay (2014) reported *Thalassionema nitzschioides, T. frauenfeldii* and one dinoflagellate species *Ceratium furca* were dominantly observed in Thal Chaung, Eastern part of Domel Island, Myeik Archipelago. This result was the same as the present study. Yin Yin Htay (2014) described that *Thalassionema nitzschioides, Chaetoceros curvisetus, Lauderia annulata, Bacteriastrum varians, Ditylum sol,* and one dinoflagellate species *Ceratium furca* were dominantly found in Tasaki Shin Kyun, Southern part of Domel Island, Myeik Archipelago. This observation was quite similar to the present study.

Zarni Ko Ko (2014) described *Lauderia annulata, Chaetoceros curvisetus* and *Thalassionema nitzschioides* were dominant species in Elphinstone Island waters, Myeik Archipelago. These results were similar to the present study. Yin Yin Htay (2016) described *Chaetoceros curvisetus* Cleve, *C. denticulatum* Lauder, *C. peruvianum* Brightwell, *C. lauderi* Ralfs and *C. lorenzianum* Grunow were more abundant in Myeik coastal waters. However *Chaetoceros pseudocurvisetum* was more abundant than other species during the present study. Yin Yin Htay (2018) described the phytoplankton abundance was the negative correlation with nitrate, in the Myeik coastal waters. This result was nearly similar to the present study.

Conclusions

The variation of phytoplankton distribution, abundance, the dominant species and species composition were mostly influenced by the seasonal changes in environmental parameters (salinity, temperature, pH, transparency, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen). The more abundance of phytoplankton 1720 cell/L was recorded at the Premonsoon season during the low nutrient (ammonia nitrogen 0.05 ppm; nitrite nitrogen 0.03 ppm and nitrate nitrogen 0.14 ppm) than Monsoon and Postmonsoon seasons. Maung Ma Kan water is high productivity.

Acknowledgements

We are very thankful to Dr. Ni Ni Oo and Dr. Win Win Than, Pro-rectors of Myeik University for their permission to carry out this research. We wish to express our special thanks to Professor Dr. Nyo Nyo Tun, Head of Department of Marine Science, Myeik University, for supporting us and for allowing us to use the materials from the Department in doing practical work. Our special thanks go to our parents, for their kindness and financial support throughout the study period.

References

Ariyadej, C., Tansakul, R., Tansakul, P. and Angsupanich, S. (2004). Phytoplankton diversity and its relationships to the physico-chemical environment in the Banglang Reservoir, Yala Province Songklanakarin.*J. Sci. Technol.*, **26**(5): 595-607.

Boonyapiwat, S. (1997). Distribution, abundance and species composition of phytoplankton in the South China Sea, Area I: Gulf of Thailand and East Coast of Peninsular Malaysia. 111-134 pp.

Booonyapiwat, S., Sada, M. N., Mandal, J. K. and Sinha, M. K. (2007). Species Composition, Abundance and Distribution of Phytoplankton in the Bay of Bengal. Report on the Ecosystem-Based Fishery Management in the Bay of Bengal (in press). 53-64.

Khin Yu Nwe. (2011). Study on the species identification, composition, distribution and abundance of phytoplankton from Myeik adjacent waters. Unpublished M. Res. Thesis. Department of Marine Science, Myeik University, Myanmar. 1-108 pp.

Kocer, M. A. T. and Sen, B. (2014). Some factors affecting the abundance of phytoplankton in an unproductive alkaline lake (Lake Hazar, Turkey). *Turkish Journal of Botany* 38: 790-799.

Ogbuagu, D. H. and Ayoade, A. A. (2012). Seasonal Dynamics in Plankton Abundance and Diversity of a Freshwater Body in Etche, Nigeria.*Environment and Natural Resources Research*, **2**(2): 48-59.

Pandiyarajan, R. S., Shenai-Tirodkar, P. S., Ayajuddin, M. and Ansari, Z. A. (2014). Distribution, abundance and diversity of phytoplankton in the inshore waters of Nizampatnam, South East coast of Indian. Vol. **43**(3): 348-356.

Rao, D. V. S. and Al-Yamani, F. (1998). Phytoplankton ecology in the waters between Shatt Al-Arab and Straits of Hormuz, Arabian Gulf: A review. *Plankton Biol. Ecol.*, 45 (2): 101-116.

Saravanakumar, A., Rajkumar, M., Thivakaran, G.A. and Serebiah, J. S. (2008). Abundance and seasonal variations of phytoplankton in the creek waters of western mangrove of Kachchh-Gujarat.*Journal of Environmental Biology*, **29**(2) 271-274.

Si Thu Hein. (2010). Study on the phytoplankton in Pahtaw-Pahtet waters, Myeik. Unpublished Master Thesis.Department of Marine Science, Myeik University, Myanmar.1-74 pp.

Su Myat, Dr. (2013). Phytoplankton community occurring in the southern coast of Myanmar especially focusing on potentially harmful dinoflagellates.Unpublished Ph. D. Thesis. Graduate School of Biosphere Science, Hiroshima University, Japan.1-191 pp.

Yin Yin Htay. (2014). Ecology of phytoplankton communities in Myeik Coastal waters. Unpublished PhD. Thesis. Department of Marine Science, Mawlamyine University, Myanmar. 1-501 pp.

Yin Yin Htay. (2014). Study on some phytoplankton of Thal Chaung, Eastern part of Domel Island, Myeik Archipelago. *Departmental Research, Myeik University, Myanmar*. 1-35 pp.

Yin Yin Htay. (2014). Study on some phytoplankton of Tasaki Shin Kyun, Southernpart of Domel Island, Myeik Archipelago. *Departmental Research, Myeik University, Myanmar*. 1-41 pp.

Yin Yin Htay. (2016). Ecology of genus *Chaetoceros* (Phytoplankton) in Myeik coastal waters. *University of Research Journal, Myanmar*. vol. **8** (4): 53-73.

Yin Yin Htay. (2018). Species Succession of Phytoplankton in Relation to Some Physico-Chemical Parameters in Myeik Archipelago, Southern Myanmar. *Journal of the Myanmar Academy of Arts and Science*. vol. **17** (4): 57-80.

Zarni Ko Ko. (2014). Study on the phytoplankton in the Elphinstone Island waters, Myeik Archipelago.Unpublished M. Res. Thesis. Department of Marine Science, Myeik University, Myanmar. 1-121 pp.