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Checklist of phytoplankton species in the Egyptian Red Sea Coast of Hurghada

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ABSTRACT

Surface phytoplankton samples were collected at twelve stations of Hurghada coast of the Red Sea. Phytoplankton samples were conducted monthly during the period from August 2014 to July 2015. The phytoplankton population was diversified accounting 138 species which comprised mainly of two groups; dinoflagellates (67 species) and diatoms (64 species), and the rest of species (7 species) belong to other four groups. The dominant genera, in terms of the number of species, were *Tripos*, *Protoperidinium* and *Gonyaulax* for dinoflagellates, while *Chaetoceros*, *Rhizosolenia* for diatoms. The present study added 35 new records to the proper Red Sea. Of these species, 17 species of diatoms and 15 dinoflagellates in addition to two species of coccolithophores and one species of Chlorophyceae.

INTRODUCTION

The Red Sea is a large marine ecosystem (2250 km long), lying between the African and the Asian continental shelves. It provides habitat for a wide range of marine species, some of which are endemic (Baars *et al*. 1998). Phytoplankton studies in the Red Sea started since 1900 through a few scattered different expeditions (Cleve 1900, 1903; Ostenfeld and Schmidt 1901; Schröder 1906; Karsten 1907; Matzenauer 1933). Halim (1969) reported the first review on the plankton of the oceanic water of the central Red Sea with collected data from the previous studies. He listed 125 dinoflagellates and 84 diatom species, and stated that genus *Ceratium* is the main component of phytoplankton in the Red Sea. Afterward, many studies on the phytoplankton species composition and standing crop of the northern Red Sea were conducted along either western coast (Egyptian) or eastern coast (Saudi Arabia) of the Red Sea and the two gulfs, Suez and Aqaba Gulfs.

Considering the studies in the western coast of the Red Sea and the two gulfs, Dowidar (1983) described 51 species belong to genus *Ceratium* in the Red Sea and Gulf of Suez. Ibrahim (1988) reported 111 species in the Foul bay. El-Shrif and Abo El-Ezz (2000) recorded a total of 106 phytoplankton species and varieties in the northern Red Sea and Gulf of Aqaba, including 23 species in Hurghada. Madkour (2000) and Madkour *et al*. (2007) constructed intensive study on the Suez Canal and northern end of Gulf of Suez, recording 287 species. Deyab *et al*. (2004) recorded 200 phytoplankton species in the Suez Canal, Suez Gulf and northwest Red Sea coast. In Halayib-Shalatin, Abel Rahman and Nassar (2005) found 25 species of phytoplankton associated with mangroves.

Madkour *et al*. (2010) recorded 181 phytoplankton species in the southern of the Sinia Peninsula and the two Gulfs with dominance of dinoflagellates (116 species) than diatoms (60 species). Nassar *et al.* (2014) identified 145 phytoplankton species in the coastal water of the northwest Red Sea, while Nassar and Khairy (2014) gave a checklist of 207 phytoplankton species in the Egyptian Red Sea and some surrounding habitats during the period 1990–2010.

Phytoplankton community structure and species composition in the eastern coast of the Red Sea have been investigated through many studies (Shaikh *et al*. 1986; Khalil and Ibrahim 1988; Touliabah *et al*. 2010; Kürten *et al*. 2015; Devassy *et al*. 2016, 2017). Recently, Ismael (2015) reviewed the phytoplankton and primary productivity status in the Red Sea proper, Suez and Aqaba Gulfs since Halim (1969) and listed 389 species and varieties in the entire Red Sea. Devassy *et al*. (2017) added 118 species of phytoplankton species to the last review by Ismael (2015). All the previous studies in the western coast of the Red Sea were seasonal and covered large areas. Although, the phytoplankton community of the Red Sea has been studied since 1969s, the information about the phytoplankton species composition of the northern Red Sea of Egypt is scarce. The aim of the present research is to study the species composition of phytoplankton community with a check list of recorded species in the investigation area.

MATERIALS AND METHODS

Study area

The present study was carried out in the north western coast of the Red Sea off Hurghada, with an area of about 400 km^2 extending about 40 km along coastline and 10 km seaward from coastline to the borders of Big Gifton Island. The area was divided into 12 stations as follow: four sites from north to south and at each site, three stations in perpendicular to coastline with 5 km distance between each station were taken (Fig. 1).

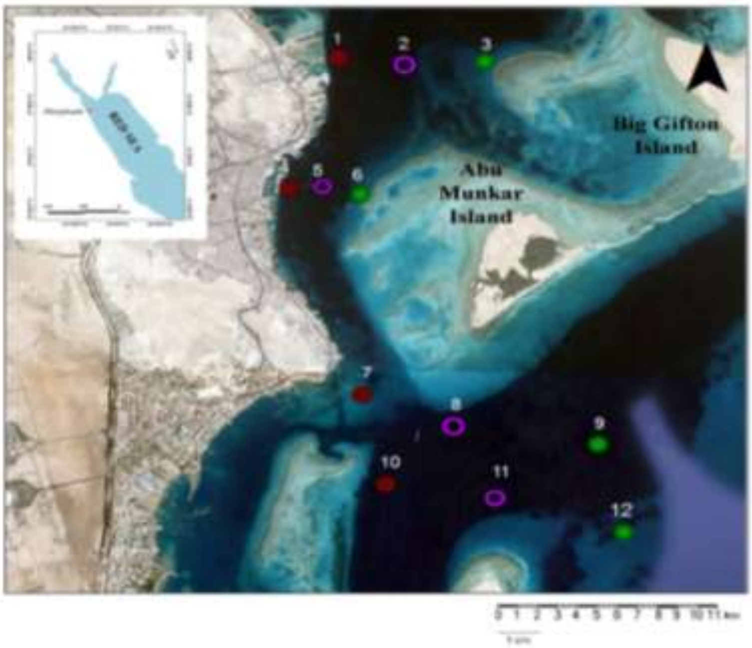

Fig. 1: Location of sampling sites.

Phytoplankton sampling and identification

Phytoplankton samples were collected by net of 20 µm mesh size (20 cm mouth diameter and 60 cm length). The net was towed horizontally in the morning (7-9 a.m) for about 5 min at a speed of 1.5 knot. Samples were preserved immediately in 4% buffered formalin. Phytoplankton samples were collected monthly from August 2014 to July 2015 at all stations. Phytoplankton taxa were identified to the species level using many references; Cupp (1943); Hendey (1946); Stewart and Mattox (1975); Taylor (1976); Dodge 1982, 1985; Tomas (1997); Young *et al*. (2003); Al-Kandari *et al*. (2009). The valid and accepted names of the phytoplankton species were based on the taxonomic database sites such as AlgaeBase.com (AB), World Register of Marine Species (WoRMS), Nordic Microalgae and Aquatic Protozoa (NOD) and Integrated Taxonomic Information System (ITIS).

RESULTS AND DISCUSSION

A total of 138 species of phytoplankton belonging to 58 genera was recorded in the present study. The recorded species were classified into six divisions, of them, Bacillariophyceae (diatoms) and Dinophyceae (dinoflagellates) contained relatively close number of species (67 and 64, respectively), and collectively represented the main bulk (95%) of the total phytoplankton community. Other divisions; Cyanophyceae (cyanobacteria), Haptophyta (coccolithophores), Ochrophyta (silicoflagellates) and Chlorophyceae (chlorophytes) were collectively represented by a very low number of species (7 species).

The last checklist and review on the phytoplankton species recorded in the Red Sea were performed by Nassar and Khairy (2014), Ismael (2015) and Devassy (2017). Nassar and Khairy (2014) in their review mentioned the presence of 128 species from the entire Egyptian Red Sea proper during 1990-2010 while Ismael (2015) reported 377 species and varieties in the proper Red Sea. The present study added 76 species to the review conducted by Nassar and Khairy (2014) while 67 species were added to that by Ismael (2015). In addition, 74 species was added to the species list by Devassy *et al*. (2017). When comparing the present study with Nassar and Khairy (2014), Ismael (2015) and Devassy *et al*. (2017), 35 species were found to be new to the water of the proper Red Sea (Table 1). Of these species, 17 species belong to diatoms (2 centric and 15 pennate diatoms), and 15 species from dinoflagellates, in addition to two species of coccolithophores (*Emiliania huxleyi* and *Coronosphaera mediterranea*) and one species of Chlorophyceae (*Pterosperma undulatum*).

In the present study, diatoms included 64 species belong to 35 genera with dominance of pennate diatoms (41 species) than centric (23 species). The dominant genera, in terms of the number of species, were *Chaetoceros* (5 species) and *Rhizosolenia* (5 species). The dinoflagellates were represented by a total of 67 species and varieties belong to 16 genera. The genera *Tripos*, *Protoperidinium*, *Prorocentrum* and *Gonyaulax* showed the highest number of species (28, 7, 5 and 5 species, respectively). In addition, 3 species within 3 genera of cyanobacteria, 2 species within 2 genera of coccolithophores and only one species from each of silicoflagellates and chlorophytes were recorded. The long-term study of phytoplankton community in the Red Sea revealed that the genus *Tripos* suffered from pronounced changes in its diversity between 47 Dowidar (1983), 51 species (Ismael 2015) and 28 species during the present study. Such difference could be related to methodology of collection, temporal strategy of sampling and the area concerned in each study. *Protoperidinium* (7 species), *Chaetoceros* and *Rhizosolenia*

(5 species) came in the second order which were pronouncedly more diversified in the records of Ismael (2015) as follows; *Protoperidinium* (39 species); *Chaetoceros* (27 species) and *Rhizosolenia* (16).

Table 1: List of the phytoplankton species recorded in the present study with comparison to the recorded species in the previous studies.

Species in the present study	**Nassar and Khairy[a] (2014)**	**Ismael[b] (2015)**	**Devassy *et al.*[c] (2017)**
Diatoms			
Centric diatoms			
Actinocyclus octonarius[a,c]		+	
Azpeitia nodulifera[c]	+	+	
Bacteriastrum delicatulum[a]		+	+
Cerataulina pelagic	+	+	+
Chaetoceros anastomosans[c]	+	+	
Chaetoceros decipiens	+	+	+
Chaetoceros lorenzianus[c]	+	+	
Chaetoceros peruvianus	+	+	+
*Chaetoceros simplex**			
Cocconeis placentula[c]	+	+	
Coscinodiscus centralis[a,c]		+	
*Coscinodiscus concavus**			
Coscinodiscus granii	+	+	+
Coscinodiscus radiates	+	+	+
Guinardia flaccid	+	+	+
Guinardia striata[b]	+		+
Hemiaulus hauckii	+	+	+
Odontella aurita[b,c]	+		
Paralia sulcata[b,c]	+		
Proboscia alata	+	+	+
Pseudosolenia calcar-avis	+	+	+
Rhizosolenia bergonii	+	+	+
Rhizosolenia imbricate	+	+	+
*Triceratium favus**			
Pennate diatoms			
Amphora lineolata[b]	+		+
Asterionellopsis glacialis[b]	+		+
Bacillaria paxillifera[a,b]			+
Cymbella ventricosa[b,c]	+		
Diploneis crabro[a]		+	+
*Diploneis weissflogii**			
Entomoneis paludosa[b,c]	+		
*Fogedia finmarchica**			
Fragilariopsis cf. *kerguelensis**			
Grammatophora marina[b,c]	+		
Gyrosigma attenuatum[b]	+		+
*Gyrosigma balticum**			
*Halamphora coffeiformis**			
*Haslea balearica**			
Iconella hibernica[b,c]	+		
Licmophora abbreviata[b,c]	+		
Licmophora flabellata[b]	+		+
Licmophora gracilis[b,c]	+		
Lyrella clavata[a,b]			+
Lyrella lyra[b]	+		+
*Mastogloia erythraea**			

Con: Table 1

Species in the present study	**Nassar and Khairy[a] (2014)**	**Ismael[b] (2015)**	**Devassy *et al.*[c] (2017)**
Mastogloia sp.[a,c]		+	
Navicula cancellata[b,c]	+		
Nitzschia longissima	+	+	+
Nitzschia sigma[c]	+	+	
Petroneis cf. *marina**			
*Petroneis monilifera**			
*Pinnularia cruciformis**			
*Plagiodiscus nervatus**			
Plagiotropis lepidoptera[b]	+		+
Pleurosigma cf. *diverse-striatum**			
Pleurosigma formosum[a,c]		+	
Pseudo-nitzschia pungens[c]	+	+	
Striatella unipunctata[b,c]	+		
*Surirella fastuosa**			
Synedra ulna[c]	+	+	
Thalassionema frauenfeldii[c]	+	+	
Thalassionema nitzschioides	+	+	+
*Trachyneis aspera**			
Tryblionella punctata[a,b]			+
Dinoflaellates			
*Archaeperidinium minutum**			
Ceratocorys armata[a]		+	+
Ceratocorys gourretii[a]		+	+
Ceratocorys horrida[a]		+	+
Coolia cf. *monotis**			
*Dinophysis acuta**			
Dinophysis caudate	+	+	+
Dinophysis miles[a]		+	+
Excuvilla compressa[b,c]	+		
Goniaulax digitalis[a,b]			+
Goniaulax kofoidii[a,b]			+
*Goniaulax striatum**			
Gonyaulax polygramma[a]		+	+
Gonyaulax spinifera[a]		+	+
*Histioneis paulsenii**			
Lingulodinium polyedra[a,b]			+
Ornithocercus quadratus[a,c]		+	
*Oxytoxum sceptrum**			
Oxytoxum tesselatum[a,c]		+	
*Paleophalacroma unicinctum**			
Phalacroma rapa[c]	+	+	
Phalacroma rotundatum[a,b]			+
Podolampas palmipes[a]		+	+
Podolampas spinifera[a,b]			+
Prorocentrum compressum[a,c]		+	
Prorocentrum gracile	+	+	+
Prorocentrum lima[a,b]			+
Prorocentrum micans	+	+	+
*Prorocentrum minimum**			
Protoceratium cf. *reticulatum*[a]		+	+
Protoceratium spinulosum[a,c]		+	
Protoperidinium cerasus[c]	+	+	
Protoperidinium depressum	+	+	+
Protoperidinium divergens	+	+	+

Con: Table 1

Species in the present study	**Nassar and Khairy[a] (2014)**	**Ismael[b] (2015)**	**Devassy *et al.*[c] (2017)**
Protoperidinium elegance[a]		+	+
Protoperidinium pellucidum[a,c]		+	
Protoperidinium solidicorne[a,c]		+	
Protoperidinium steinii	+	+	+
Pyrodinium bahamense[a,c]		+	
*Tripos angustocornis**			
Triposbrevis	+	+	+
Tripos brevis var. *curvulus**			
Tripos candelabrus	+	+	+
Tripos carriensis[b,c]			+
Tripos contortus[a]		+	+
Tripos declinatus[a]		+	+
*Tripos deflexus**			
*Tripos eugrammus**			
Tripos extensus[c]	+	+	
Tripos furca	+	+	+
Tripos fusus	+	+	+
*Tripos hircus**			
Tripos horridus[a]		+	+
Tripos horridus var. buceros[a,c]		+	
Tripos incisus[a]		+	+
Tripos inflatus[a]		+	+
Tripos kofoidii	+	+	+
Tripos macroceros	+	+	+
Tripos massiliensis	+	+	+
Tripos muelleri	+	+	+
Tripos muelleri var. *atlanticus**			
Tripos pentagonus[a]		+	+
*Tripos saltans**			
Tripos setaceus[b,c]	+		
Tripos teres[a]		+	+
Tripos trichoceros	+	+	+
Tripos vultur[a,b]			+
Cyanobacteria			
Chroococcus turgidus[b,c]	+		
Oscillatoria tenuis[b,c]	+		
Trichodesmium erythraeum[c]	+	+	
Chlorophytes			
*Pterosperma undulatum**			
Silicoflagellates			
Dictyocha fibula[c]	+	+	
Coccolithophores			
*Emiliania huxleyi**			
*Coronosphaera mediterranea**			

*new records

a, b, c Species did not list by Nasser and Khairy (2014), Ismael (2015)and Devassy *et al*. (2017), respectively

Although, the majority of studies indicated higher diversity of phytoplankton in the eastern Red Sea coast than the western coast (Shaikh *et al*. 1986; Dowidar *et al*. 1978), the present study revealed clear similarity in species composition of Hurghada with that observed in the Saudi Arabia coast by Devassy *et al*. (2017). Halim (1969), Madkour *et al*. (2010) and Ismael (2015) stated that the number of dinoflagellate species was higher than that of diatoms in the Red Sea proper. These observations support the present findings, but with little difference between the two groups (64 diatoms and 67 dinoflagellates). Increasing number of diatom species with that of dinoflagellates is a common characteristic in the western coast of the Red Sea (Ibrahim 1988; El-Shrif and Abo El-Ezz 2000; Deyab *et al*. 2004; Abel Rahman and Nassar 2005; Nassar *et al*. 2014). This contradicts with observations of the present study as well as with those of Halim (1969) and Ismael (2015). This could be related to dinoflagellates disability to tolerate pollution (Smayda and Shimizu 1993) which also can be source to increase silicate in water, hence increase diversity of diatoms in their sampling site (Deyab *et al*. 2004).

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REFERENCES

Abel Rahman, N. S. and Nassar, M. Z. (2005). Preliminary studies on plankton communities associated with the mangrove forest habitats at Halayib-Shalatin sector, Red Sea, Egypt. Pakistan Journal of Marine Sciences, 14(2): 133-144.

Al-Kandari, M.; Al-Yamani, F. and Al-Rifaie, K. (2009). Marine Phytoplankton Atlas of Kuwait’s Waters. Kuwait Institute for Scientific Research.

Baars, M. A.; Schalk, P. H. and Veldhuis, M. J. W. (1998). Seasonal fluctuations inplankton biomass and productivity in the ecosystems of the Somali Current, Gulf of Aden, and Southern Red Sea. In: Sherman *et al*. (eds) Large marine ecosystems of the Indian Ocean: assessment, sustainability, and management. Blackwell Science, Oxford, 143-174.

Cleve, P. T. (1900). Plankton from the Red Sea. Öfvers K Vetensk Akad Förh, 57(9): 1025-1038.

Cleve, P. T. (1903). Report on plankton collected by Mr. Thorild Wulff during a voyage to and from Bombay. Arkivför Zoology, Stockholm, 1: 329-381.

Cupp, E. E. (1943). Marine plankton diatoms of the west coast of North America. University of California Press, Berkely and Los Angeles, California, pp 238.

Devassy, R. P.; Al-Aidaroos, A. M.; El-Sherbiny, M. M. and Abdul Mohsin Al-Sofyani, A. M. (2017). Spatial variation in the phytoplankton standing stock and diversity in relation to the prevailing environmental conditions along the Saudi Arabian coast of the northern Red Sea. Marine biodiversity, 47(4): 995-1008.

Devassy, R. P.; Al-Aidaroos, A. M.; El-Sherbiny, M. M. and Kürten, B. (2016). Biodiversity of marine net-phytoplankton in the oligotrophic Red sea, with special reference to diatoms and dinoflagellates. International Conference on Marine Environment of the Red Sea (ICMERS), Faculty of marine Sciences, King Abdul Aziz University; Nov 14-16; Saudi Arabia.

Deyab, M. A.; Khedr, A. A. and El-Naggar, M. A. (2004). Phytoplankton distribution in relation to environmental factor along the Suez Canal and the Red Sea coast of Egypt. Algological studies, 112: 123-140.

Dodge, J. D. (1982). Marine Dinoflagellates of the British Isles. Her Majesty's Stationary Office, London.

Dodge, J. D. (1985). Atlas of Dinoflagellates. Botany Department. Royal Holloway. Bedford Colleges (University of London), Egham.

Dowidar, N. M. (1983). The genus *Ceratium* from the Red Sea. Journal of Faculty of Marine Science. King Abdel-Aziz University, Jeddah, 3: 5-37.

El-Sherif, Z. M. and Aboul-Ezz, S. (2000). Checklist of plankton of the northern Red Sea. Pakistan Journal of Marine Sciences, 9 (1-2): 61-78.

Halim, Y. (1969). Plankton of the Red Sea.Oceanography and Marine Biology - An Annual Review, 7:231-275.

Hendey, N. I. (1946). An Introductory Account of the Smaller Algae of Biritish Coastal Waters. Part V: Bacillariopycea (Diatoms). Her Majesty's Stationery Office, London.

Ibrahim, E. A. (1988). Observations on the distribution of phytoplankton in Foul Bay, Red Sea. Bulletin of Institute of Oceanography and Fisheries, A. R. E., 14(1): 91-103.

Ismael, A. A. (2015). Phytoplankton of the Red Sea. In: NMA R, ICF S (eds) The Red Sea: the formation, morphology, oceanography and environment of a Young Ocean basin. Springer Earth System Sciences, Berlin, pp 1-28.

Karsten, G. (1907). Das indishe Phytoplankton. Wissen schaftliche Ergebnisse Valdivia, 2: 221-548.

Khalil, A. N. and Ibrahim, A. M. (1988). Seasonal study of the surface phytoplankton of the Red Sea North of Jeddah. Arabian Gulf Journal Scientific Research Agriculture and Biological Sciences, B6 (2): 189-204.

Kürten, B.; Khomayis, H. S.; Devassy, R.; Audritz, S.; Sommer, U.; Struck, U.; El-Sherbiny, M. M. and Al-Aidaroos, A. M. (2015). Ecohydrographic constraints on biodiversity and distribution of phytoplankton and zooplankton in coral reefs of the Red Sea, Saudi Arabia. Marine Ecology, 36(4):1195-1214.

Madkour, F. F. (2000). Ecological studies on the phytoplankton of the Suez Canal. Ph. D. thesis, Facult of Science, Suez Canal Univ., Egypt.

Madkour, F. A.; Dorgham, M. M.; Hanafi, M. H. and Holligan, P. M. (2007). Comprehensive hydro-biological observations on the Suez Canal. International Journal of Oceans and Oceanography, 2(1): 125-137.

Madkour, F. F.; El-Sherbiny, M. M. and Aamer, M. A. (2010). Phytoplankton population along certain Egyptian coastal regions of the Red Sea. Egyptian Journal of Aquatic Biology and Fisheries, 14 (2): 95-109.

Matzenauer, L. (1933). Die Dinoflagellaten des Indischen Ozeans. Bot. Arch., 35:437-509.

Nassar, M. Z. and Khairy, H. M. (2014). Checklist of phytoplankton species in the Egyptian waters of the Red Sea and some surrounding habitats (1990–2010). Annual Research and Review in Biology, 4 (23): 3566-3585.

Nassar, M. Z.; Mohamed, H. R.; Khiray, H. M. and Rashedy, S. H. (2014). Seasonal fluctuations of phytoplankton community and physico-chemical parameters of the north western part of the Red Sea, Egypt. The Egyptian Journal of Aquatic Research, 40(4): 395-403.

Ostenfeld, C. H. and Schmidt, J. (1901). Plankton fradet Röde Hav Adenbugten. Videnskabelige Meddelelser Dansk Naturhistorisk Forening Kjobenhaven, 141-182.

Schröder, B. (1906). Beitragezur Kenntnis der Phytoplanktons warmer Meeres Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich, 51: 319-377.

Shaikh, E. A.; Roff, J. C. and Dowidar, N. M. (1986). Phytoplankton ecology and production in the Red Sea off Jiddah, Saudi Arabia. Marine Biology, 92:405-416.

Smayda, T. J. and Shimizu, Y. (1993). Toxic phytoplankton blooms in the Sea. Elsevier, London.

Stewart, K. D. and Mattox, K. R. (1975). Comparative cytology evolution and classification of green algae with some consideration of the other organisms with chlorophylls a and b. Botanical Review, 41: 104-135.

Taylor, F. J. R. (1976). Dinoflagellates from the International Indian Ocean Expedition. Vol. 132, pp. 1-234. Bib. Bontica.

Tomas, C. R. (1997). Identifying marine phytoplankton. Academic Press: San Diego, 858 pp.

Touliabah, H. E.; Abu El-Kheir, W. S.; Kuchari, M. G. and Abdulwass, N. I. H. (2010). Phytoplankton composition at Jeddah coast-Red Sea, Saudi Arabia in relation to some ecological factors. J King Abdulaziz Univ Sci, 22(1):115-131.

Young, J. R.; Geisen, M.; Cros, L.; Kleijne, A.; Sprengel, C.; Probert, I. and Ostergaard, J. B. (2003). A guide to extant calcareous nannoplankton taxonomy. Journal of Nannoplankton Research. 1: 1-125.

ARABIC SUMMARY

قائمة بأنواع الهائمات النباتية في الساحل المصري للبحر الأحمر بالغردقة

ساره جلال عباس - فيدكار فاضل مدكور - محمد أحمد ابوالرجال
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تهدف الدراسة الحالية إلى عمل قائمة بالهائمات النباتية الموجودة في الساحل المصري بالبحر الأحمر. تم جمع العينات من ١٢ محطة أمام ساحل مدينة الغردقة شهرياً لمده عام فى الفترة من أغسطس ٢٠١٤ إلى يونيو ٢٠١٥. تم رصد ١٣٨ نوع من الهائمات النباتية تضمنت الدياتومات وثنائية السوط التى احتوت على أعداد متقاربة نسبياً من الأنواع (٦٤و٦٧ نوعا، على التوالي)، في حين أن باقي المجموعات من الهائمات النباتية تمثلت بعدد قليل من الأنواع (٧ أنواع). كان أكثر الأجناس تواجداً من حيث عدد الأنواع (*Tripos*) , (*Protoperidinium*) و (*Gonyaulax*) مُمَثّلَةً لثنائية السوط بينما بالنسبة للدياتومات كان جنسى (*Chaetoceros*) و (*Rhizosolenia*) الأكثر تواجدا. بالمقارنة مع الدراسات السابقة, تم تسجيل ٣٥ نوع لأول مره في مياه البحر الأحمر من بينهم ١٧ نوع من الدياتومات, ١٥ من ثنائية السوط بالإضافة الى نوعين من مجموعة (Coccolithophores).