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New records algal species from the Shatt Al-Arab River, Southern Iraq

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Abstract - Shatt Al-Arab River is an important inlands river in Iraq, It is considered an important source of fresh and water for the city of Basrah, as it is used for drinking and orchards irrigation also used for industrial and commercial purposes. Sampling was carried out monthly from November 2019 to December 2020 from Shatt Al-Arab River. The present study made records nine of algae species for the first time in Iraq. Represented by six species of Chlorophyta (Eremosphaera tanganyikae, Microspora wittrockii, Monoraphidium komarkova, Mychonastes pusshpae, Scenedesmus similagineus and Spongiococcum tetrasporum), one species of Cyanophyta (Pseudanabaena catenata), one species of Dinophyta (Impagidinium paradoxum), and one species of Euglenophyta (Strombomonas verrucosa).

تسجيل تسعة أنواع طحلبية جديدة في نهر شط العرب، جنوب العراق

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المستخلص - جمعت العينات شهريا من كانون الثاني الى كانون الأول 2020 من نهر شط العرب، وسجلت الدراسة الحالية تسعة انواع من الهائمات النباتية لأول مرة في العراق، وتم اعطاء وصف وابعاد كل نوع من الانواع المشخصة، وتمثلت الطحالب الخضر بـ 6 انواع ونوع لكل من الطحالب الخضر المزرقة والطحالب الدوارة والطحالب اليوغلينية، كما تناولت الدراسة ظهور ووجود الانواع قيد الدراسة خلال اشهر السنة المختلفة في مياه النهر.

الكلمات المفتاحية: طحالب ، نوع جديد، شط العرب ، نهر

Introduction:

Shatt Al-Arab River is one of the most important hydrographic feature in the northwest of the Arabian Gulf, as this River supplies waters to the Arabian Gulf with an amount of 5 x 910 m^3 of freshwater annually, and the effect of this water is observed at a distance of 5 km from the estuary of the river in the Arabian Gulf. Shatt Al-Arab's water is usually rich in organic matter and nutritious salts, which increases the fertility of the waters of the northern part of the Arabian Gulf (Al-Lami 1986). The first environmental study conducted on the Shatt Al-Arab River was that of Mohammad (1965) which is followed by a few limited studies (Al-Kaisi, 1970; Antoine, 1977; Hameed, 1977; Pankow *et al*, 1979; Al-Saadi *et al*. 1979 and; Maulood *et al*. 1981). Our knowledge of the phytoplankton especially in the Shatt Al-Arab River is scarce and incomplete.

Therefore, this study forms an attempt to diagnose some unregistered species of algae that had not been previously recorded to support the diversity of this important waterway and a complement to previous studies.

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Materials and Methods:

Shatt Al-Arab River is originated from the junction of the Tigris and Euphrates River at Al-Quarna town north of Basra City and drain into the Arabian Gulf at latitude 57 99˚ North and longitude 35 48˚South with a total length of about 204 km (Fig. 1) (Al-Mahmood, 2012). Shatt Al-Arab River is affected by the climatic or natural conditions that prevail in the region, and the width of the Shatt Al-Arab River ranges from 400 meters to more than two kilometers (Al-Assadi, 2015).

Spread on both sides of the River many palm groves and field crops which affect the quality of the water through the flow of many fertilizers and pesticides into the River in addition to the sewage water that directly flows into it.

Five stations were chosen from different areas of the River Al-Deer, Al-Ashar, Abu-Alkhaseeb, Al-Seeba and Al-Fao. Sampling collection was done monthly from November 2019 to December 2020 from Shatt Al-Arab River, southern Iraq by using a phytoplankton net (mesh size 20 µm), with 20 cm mouth openings made by the American company Wild. The net was towed behind a boat steam at an average speed for 10-15 minutes at the middle of the River.

The contents of the net were collected in a Plastic bottle of a capacity of 100 ml and fixed with 4% formalin and labeled. Upon conducting the examination process, the sample is concentrated with a centrifuge to reduce its size, then one or two drops are taken from it and placed on a slide (Stein, 1973), then a cover slip is placed on it and left for two minutes for settling, then examined under a compound light microscope type Zeiss with camera Axio Cam lCc 3 type Zeiss (x 400, Scale 10 µm). Identification of algae are carried out with the aid of the following taxonomic literatures: Desikachary, 1959; Prescott, 1968, Prescott, 1970; Al-Saboonchi *et al*., 1990.

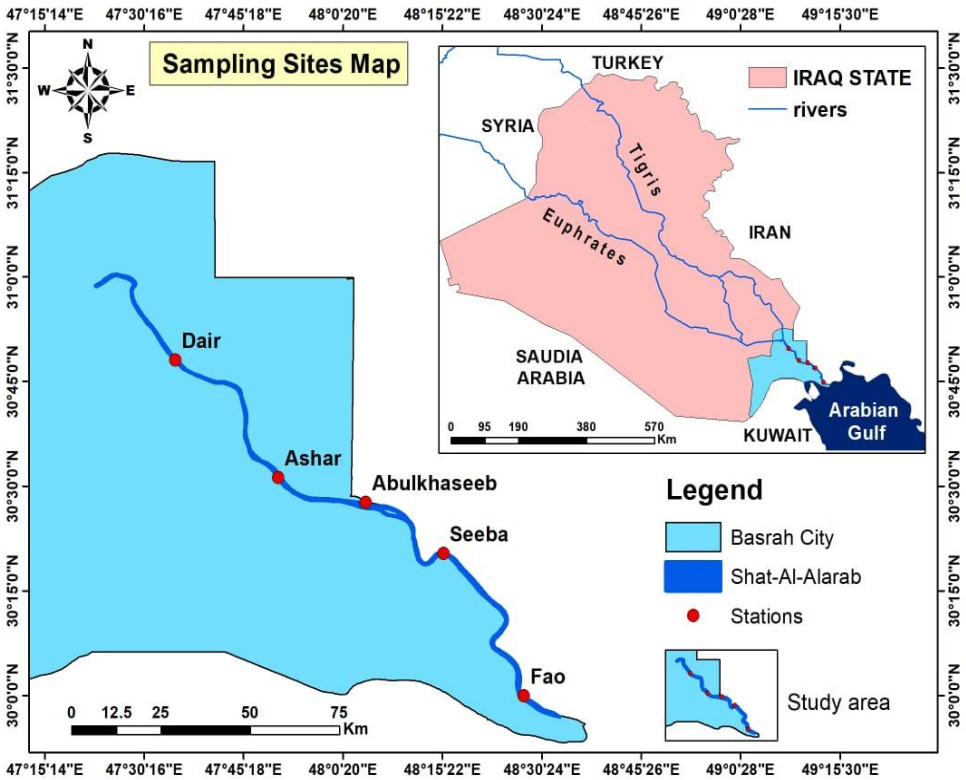


Figure 1. A map showing the locations of sampling collection sites.

Results and Discussion:

Table (1) indicated that there are large differences in the number of phytoplankton species in the study stations, and that is may be due to the differences in the environmental conditions between the stations. The number of species recorded in January, February, March, and May are more than those found in the other months at the year.

It was also noticed that most of the species were recorded in the first, second and third stations, while the last two stations had a few numbers of species, and this is because the speed of the current and the availability of light are among the most influencing factors in the composition of society in fast-flowing environments (Keithan and Lowe, 1985), because such environments are usually of a lower density in terms of the number of cells and most of the species are of the adherent type compared to the slow flowing environments. During the study period, some species showed their dominance over others the dominance of any species in any environment depends on the quality of the species in its competition with other species (Tilman, 1977).

Many taxonomic studies dealing with phytoplankton were conducted on the Shatt Al-Arab, but those with that gave a description of the species and drawings by means of Camera Lucida or by photography are very rare, such as that of Al-Handal *et al*. (1989) who studied the occurrence of some filamentous algae on the sediments of Shatt Al-Arab River and one of its side canals.

The second study was carried out by Al-Saboonchi *et al*. (1990) in which samples were collected monthly from January 1985 to June 1987 from Shatt Al-Arab River and some of its canals. Fifty-three species were recorded. Twenty four of which were found to be new records for the Shatt Al-Arab region, sixteen species were new recorded for Iraq. In the present study we are dealing with those species which were not previously described. Chlorophyta is represented by 9 species, Cyanophyta by 5 species and Xanthophyta by 2 species.

Representative of the Trebouxiophyceae genus *Eremosphaera* (with the exception of *E. viridis*) showed great variation in their morphology, and some of the described species, varieties and forms are still of uncertain taxonomic position (Stoyneva, 2006). In the present study, *Eremosphaera tanganyikae* was recorded at all months except in June (Table 1), and was recorded in the first 4 stations during January and February, while they were recorded in the second, third and fourth stations during March and May. However *Microspora wittrockii* was recorded only once throughout the study period, during February at the second station only.

Another rare species, *Microspora floccosa* (Vauch), was only reported by Al-Kaisi (1970, 1976) from some water systems in the middle and south of Iraq, but not in the Shatt Al-Arab River, and reported by Al-Handal *et al*. (1989) from Shatt Al-Arab River. Moreover, in the current study *Monoraphidium komarkova* was recorded at all stations during January, while the other species were very rare, and were recorded once or twice throughout the study period.

Nine algal species of phytoplankton were identified from Shatt Al-Arab River for the first time and they were not recorded before in the Iraqi aquatic environment, and represented by:

Eremosphaera tanganyikae. Stoyneva Gartner & Vyverman, 2006.
Stoyneva, vol. 139, p. 3-13.

Table 1. Monthly occurrence of the phytoplankton in the Shatt Al-Arab River during the study period.

Species	2020											
	Jan.	Feb.	Mar.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Station
Eremosphaera tanganyikae	+	+				+						St1
	+	+	+	+								St2
	+	+	+	+			+			+	+	St3
	+	+	+	+				+	+			St4
												St5
Microspora wittrockii												St1
		+										St2
												St3
												St4
												St5
Monoraphidium komarkova	+	+				+						St1
	+		+	+								St2
	+		+	+			+	+	+			St3
	+		+									St4
	+											St5
Mychonastes pushpae	+											St1
												St2
												St3
												St4
												St5
Scendesmus similagineus												St1
										+		St2
												St3
												St4
												St5
Spongiococcum tetrasporum												St1
												St2
	+											St3
												St4
												St5
Pseudanabaena catenata			+									St1
												St2
	+								+			St3
			+				+					St4
												St5
Impagidinium paradoxum	+											St1
												St2
												St3
												St4
												St5
Strombomonas verrucosa	+											St1
		+										St2
		+										St3

Species	2020											
												St4
												St5

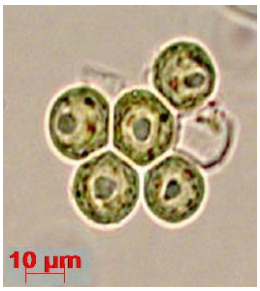
Eremosphaera tanganyikae

Microspora wittrockii

Monoraphidium komarkova

Mychonastes pusshpae

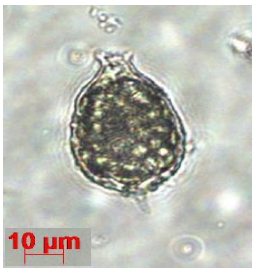
Scenedesmus similagineus



Spongiococcum tetrasporum

Pseudanabaena catenata

Impagidinium paradoxum



Strombomonas verrucosa

Figure 1. Photographs of the Planktonic algal species recorded for the first time from the Shatt Al-Arab River, Basrah, Iraq.

Description:

This is a freshwater species, its shape is elongated oval, solitary cells, surrounded by a thick cell wall, lobed from the inside, and has no flagella, chloroplasts are surrounded by a membrane, which separates them from the cell wall, cell 13.5-14.5 µm in width and 20-30 µm long, wall thickness from the top about 3-4 µm, and from the sides 1.5-2.5 µm.

Class: Trebouxiophyceae

Order: Chlorellales

Family: Oocystaceae

Genus: *Eremosphaera*

Species: *Eremosphaera tanganyikae* Stoyneva, 2006.
Microspora witrockii (Wille) Lagerheim, 1887.
Skuja, 7; Figs. 119, p. 25-85.

Description: Chlorophyta

Multicellular filamentous algae, consisting of large cells with clear borders, this species is distinguished by a golden color, the filament-forming cells are rectangular in shape 15-18 µm in length, and 12-14 µm in width, the cytoplasm is dense and fills the cell except for a vacuole near the transverse wall, live in freshwater.

Division: Chlorophyta
Class: Chlorophyceae
Order: Ulotrichales
Family: Microsporaceae
Genus: *Microspora*
Species: *Microspora wittrockii* (Wille) Lagerheim, 1887.
Monoraphidium komarkova Nygaard, 1979.
Hindak, F. (1988).34(9) 1-264.

Description:

Single cells, with tapering ends, the middle of the cell is wider then at the ends, usually its shape is straight, the plastid extends along the cell and has a bright green color, the length of the filament is approximately 44-50 µm, and its width in the middle reaches 2.5-3 µm.

Division: Chlorophyta
Class: Chlorophyceae
Order: Sphaeropleales
Family: Selenastraceae
Genus: *Monoraphidium*
Species: *Monoraphidium komarkova* Nygaard, 1979.
Mychonastes pushpae Krientiz, C. & Proschold, 2011
Krientiz, 50(1), p: 89-106.

Description:

The type species (holotype) of the genus is *Mychonastes ruminates* P.D. Simpson & S.D. Van Valkenburg. This is a freshwater species, No synonyms are currently included in algaebase, The alga is a colony of six spherical cells that are linked together by plasma ligands, cell diameter 3-4 µm.

Division: Chlorophyta
Class: Chlorophyceae
Order: Sphaeropleales
Family: Mychonastaceae
Genus: *Mychonastes*
Species: *Mychonastes pusshpae* Krientiz, 2011
Scenedesmus similagineus Hortobagyi, 1960 (Fig. 5)
Hortobagyi,. 1-345-381, pl. 64-75.

Description:

The type species (holotype) of the genus is *Scenedesmus obtusus* Meyen. No synonnyms are currently included in algaebase, this is a freshwater species, colony 2-celled. Individual cells elongated ovoid to spindle shaped poles rounded, with small spines of about 4.68 µm long it's cell body long about 17 to 19 µm, and 7.5 to 8.5 µm wide.

Division: Chlorophyta
Class: Chlorophyceae
Order: Sphaeropleales
Family: Scendesmaceae
Genus: *Scenedesmus*
Species: *Scenedesmus similagineus* Hortobagyi, 1960.
Spongiococcum tetrasporum Deason, 1959.
Deason; 574, Figs. 1-9

Description:
This is the type species (holotype) of the genus *Spongiococcum*, No synonyms are currently included in algaebase. Colonies Spherical, cells, 10-20 μm in diameter. A sponge like chloroplast, with a pyrenoid usually situated in the center, large and fragmented pyrenoid of which are polygonal and somewhat compact.
Division: Chlorophyta
Class: Chlorophyceae
Order: Chlamydomonadales
Family: Chlorococaceae
Genus: Spongiococcum
Species: *Spongiococcum tetrasporum* Deason, 1959
Pseudanabaena catenata Lauterborn, 1915.
Lauterborn, 1915: 432, pl. lll, Fig. 27

Description:
Short unbranched filaments consisting of 10 to 20 elongated cells, flexible, close to each other, the color of the filaments is dark blue to olive, the length of the cell is 4-6 μm, and the width is 2.5-3.5 μm.
Division: Cyanophyta
Class: Cyanophyceae
Order: Synechococcales
Family: Pseudanabaenaceae
Genus: *Pseudanabaena*
Species: *Pseudanabaena catenata* Lauterborn, 1915.
Impagidinium paradoxum Wall, 1967.
Wall, pl. 15, Figs. 5-8, p. 106-107; Zonneveld, 39(3), p. 387-407.

Description:
Solitary cell, ovoid in shape, protruding from its outer surface several short spines, the length of the cell body 35-45 and 25-35 its width, The front of the body is slightly protruding, the surface of the body is covered with granules, marine and freshwater species.
Division: Dinophyta μm
Class: Dinophyceae
Order: Gonyaulaceae
Family: Gonyaulacales
Genus: *Impagidinium*
Species: *Impagidinium paradoxum* Wall, 1967.
Strombomonas verrucosa (E. Daday) Deflandre, 1930
Araujo, vol.6, pl.(1)-203, Figs. 306.; Hu, H. pp.(4 pls. of 16 Figs.), (i-iv), i-ixv, 1-1023

Description:

Solitary cells, conical in shape, the anterior pole is usually round and prominent 2.5-5 µm in length, and the back pole is slightly extended 2-3.5 µm, the cytoplasm is lobular and fills the cell, length of the body is 41-43 µm, and it's width 25-27 µm. Some zigzags you can be seen in the outer wall, this is a freshwater species.

Division: Euglenophyta
Class: Euglenophyceae
Order: Euglenida
Family: Euglenidae
Genus: *Strombomonas*
Species: *Strombomonas verrucosa* (E. Daday) Deflandre, 1930.

Reference:

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