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Article review

Some Classes of epipelic in Iraqi waters

Dr. Sheimmaa Jabar Hadi
Nawras Alwan Hussain

Department of Biology, Faculty of Sciences, University of kufa, IRAQ
Corresponding author: Shaymaa.aljuhaishi@uokufa.edu.iq

Abstract.

This review aimed to survey some classes of epipelic composition in Iraqi waters. These data were taken from investigations of epipelic in Iraq, covering both freshwater and saline waters in many cities. 266 species of epipelic algae belonging to 133 genera were identified. Bacillariophyta (diatoms) was the predominant taxon (161 species) followed by Chlorophyta (53 species), Cyanophyta (41 species), Euglenophyta (8 species) and Dinophyta (3 species).. This study proposes to present a checklist of epipelic in Iraq, built on the compilation of preceding surveys.

Keywords*: review, epipelic, classes, Iraqi water.*

Introduction

The importance of benthic algae in Iraqi aquatic ecosystems was subjected to investigations recently . Many authors have previously recognized epipelic algae as bioindicators in different aquatic ecosystems of Iraq. Benthic algae are an important part of algae community and have been widely used as a tool to assess water quality[1]

The studies of epipelic algal ecology was pioneered in freshwater habitats by Round [2, 3, 4, 5, 6]. Lately, Algae can be found in all aquatic systems, and are the most diverse assemblage of organisms that can be sampled easily and identified readily to species or varieties [7] Epipelic can be the heralds of infection or decease. Some of them create biotoxins, making these kinds accountable for blooms or "red tides," or harmful algal. These toxins can cause irritation in the respiratory system in creatures and other risks [8].

In Iraq, abundant efforts have been used on distribution and identification of epipylic. So, this review offered data of the composition of non-diatom algal taxa in Iraq.

Sources and Methods

Literature review. Data were taken from thirty-one reference (22 research papers, four Ph. D. thesis, and five M. Sc. thesis, dealing with the epipelic. Data from the references were gathered to make the current list of epipelic. The references are (9 - 44): Ali, *et al.* (2018), Hassan, *et al* (2017), Salman ,*et al*(2013), Al Fatlawi (2011), Hassan, *et al.*, (2014), Hassan and Shaawait (2013), Hassan and Al- Budulameer(2012), Abbas and Hassan(2018), Hadiand

Al-Saboonchi.(1989), Kssaim and Al- lami (2002), Kassim.andAl-Saadi,.(1994), Kassim (2007) Al-Timimi,. (2012), Al-Ghanmi (2011), Al-Nashi (2012), Salman, *et al.* (2013), Hindi. (2016), Al-Saboonchi (1995), Kassim. (2007), Al-Taee, (2010), .Kadhim *et al*., (2013) Al-Saadii and Hadi (1987), Hassan, And Shaawiat,(2015) AL-Lami, Al-Shawi (1999), Maulood. and Toma (2004), AL-Lami,*et al*., (1999), Al-Shaban (1996), Kadhim, *al*., (2013).

Alkam,. and Al-Nashi, (2013) AL-Saadi *et al* .,. (1979), Hassan, *et al.* (2014), Hassan, *et al.* (2010), Hassan, (1995), Hassan, *et al.* (2007), Al-Zubaidi(2012),

Kassim and Mukai(2006), Khthim and Al-Amari and (2013), Hassan *et al*., (2017), Al-Handal(1992)

Results and discussion :

This checklist of non-diatom epipelic taxa has 133 taxa (266 recognized to species level) which vary among four division (table1). The variety of epipelic present in Iraqi waters referred to their diverse limnological characteristics. The factors effect on qualitative of plankton. Uncontaminated ecosystems are recognized via high values of diversity [2, 4, 5]. While, the existence and domination of some algae as *Nitzschia, Navicula, Cymbella, Gomphonema, Surirella, Cocconeis, Aulacoseira, Oscillatoria, Lyngbya, Spirulina, and Scenedesmus* , referred to organic contamination in the water [1, 3, 6].

As a outcome, this review included five divisions, among these divisions, Chlorophyta was dominant, representing 19.29. % of the detected taxa (27taxa and 53 species), followed via Cyanophyta (14 taxa and 41 species). Euglenophyta (2 taxa and 8 species), Dinophyta (22 taxa and 21 species), Almost all surveys verified Chlorophyta was dominanced from non diatom divisions (20, 64). Other divisions as, Cyanophyta, Dinophyta, and Euglenophyta had fewer domination, this may be because they have narrow number of species, likewise they want many nutrients [2, 4, 5]. This review listed 266286 species only, because rather insufficient surveys on epipelic from Iraqi waters.

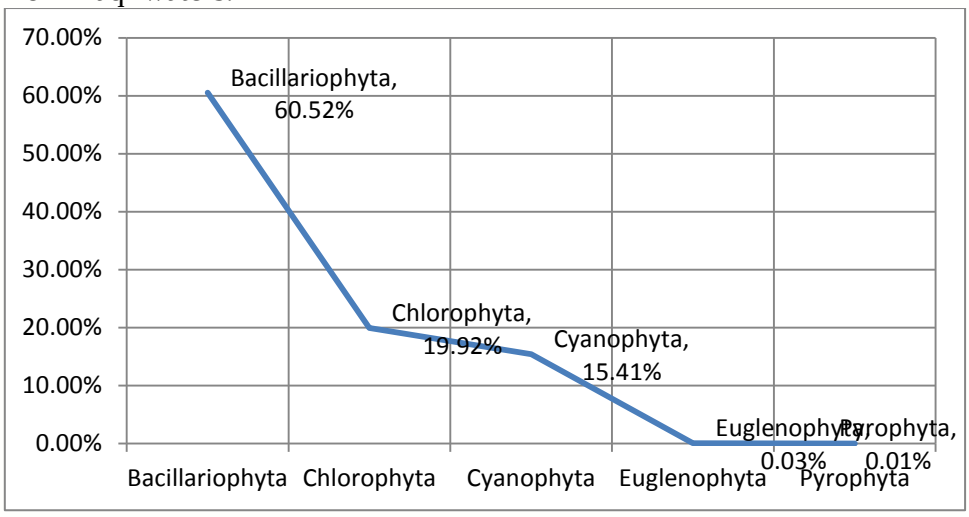

Figure1. The percentage of Divisions in this review

Table 1. List of epipelic algae that found in Iraq

Divission	Taxa
Bacillariophyta centrales	
	Aulacoseira ambigua (Grunow) Simonsen *A. granulata* (Ehr.) Simonsen *Coscinodiscus asteromphalus* Ehrenberg *C. granii* L.F.Gough *C. denarius* A. Schmidt *Cyclotella comta* Kützing *C. meneghiniana* Kützing *C. ocellata* Pantocsek *Melosira. ambigua* (Grunow) Otto Müller *M. granulate* (Ehr.) Ralfs *M. varians* Agardh *Stenopterobia delicalissinia* (F.W.Lewis) Brébisson ex Van Heurck *Stephanodiscus agassizensis* Håkansson & Kling
	Thalassiosira baltica (Grunow) Ostenfeld
Pennales	

	Achnanthes affinis Grunow *A. minutissima var. affinis* (Grunow) Lange-Bertalo *A. longipes* *A. microcephala* (Kütz.) Grunow *Achnanthidium exiguum* Grunow *Amphora bioculata* Cleve *A. ovalis* (Kütz) Kützing *A. ovalis var. pediculus* (Kütz.)Van Heurck *A. pediculus* (Kütz) Grunow ex A.Schmidt *A .veneta* Kützing *Anomoeoneis sphaerophora* Pfitze *Bacillaria paradoxa* J.F.Gmelin *B. paxillifera* (O.F.Müller) T.Marsson *Caloneis amphisbaena* (Bory.) Cleve *C. amphisbaena var. subsalina* (Donkin) Cleve *C. bacillum* (Grunow) Cleve *C. permagna* (Bailey) Cleve *C. ventricosa* (Ehr.) F.Meister *Cocconeis pediculus* Ehrenberg *C. placentula* Ehrenberg *C. placentula var. euglypta* (Ehr.) Cleve *C. amphisbaena var. subsalina* (Donkin) Cleve *C. placentula var. lineata* (Ehr.) Van Heurck *Cymatopleura elliptica*(Bréb) W.Smith *C. aspera* (Ehr.) Cleve *C.Agardh* *C. cistula*(Hemp.)Grunow *C. lanceolata* (*C.Agardh*)Kirchner *C. lange-bertalotii* Krammer *C. ovalis* (Kütz.) Brébisson & Godey *C. prostrate* (Berk.) Cleve *C. solea* (Breb.) W.Smith *C. solea var. apiculata* (W.Smith) Ralfs *C. tumida* (Breb.)Van.Heurck *C. turgid* (Greg.)Cieve *C. turgida* (Greg.) Cleve *C. turgidula var. kappii Cholnoky* *C. ventricosa (C.Agardh*)

	Diatoma vulgare Bory *Diploneis elliptica*(Kütz.) Clev *Encyonema reichardtii*(Krammer) D.G.Mann *E. silesiacum*(Bleisch) D.G.Mann *Fragilaria .capucina var. gracilis* (Oestrup) Huste *F. capucina var. rumpens*(Kütz.) Lange-Bertalotex Bukhtiyarova *F.capucina* Desmazieres *F. construens* (Ehr.)Grunow *F. construens f. binodis* (Ehr.) Husted *F. elliptica* Schumann *F. intermedia* Grunow *F. ulna* (Nitzsch) Lange-Bertalot *F.ulna var. acus* (Kütz.) Lange-Bertalot *F. ulna var. biceps*(Kütz.) Compère *F. virescens* Ralfs *Gomphoneis olivecum*(Horne)P.Dawson ex. Ross et Simith *Gomphonema. affine* Kützing *G. clavatum* Ehrenberg *G. insignaffineE*.Reichardt *G. lagenula* Kützing *G. mesta* (S.I.Passy-Tolar &R.L.Lowe) E.Reichardt *G. minuta* P.Fusey *G. minutum* (C.Agardh)C.Agardh *G. olivaceum* (Lyng.)Kützing *G. paravalum* (Kütz.)Grunow *G. rhombicum* Fricke *G. truncatum* Ehrenberg *Gyrosigma acuminatum(*Kütz.) Rabenhorst *G. attenuatum* (Kütz.)Rabenhorst *G. fasciola* (Ehr.)J.W.Griffith & Henfrey *Mastogloia elliptica(*C.Agardh) Cleve *M. smithii* Thw. Ex. W. Smith *Mayamaea atomus*(Kütz.) Lange Bertalot *Navicula affinis* Ehrenberg *N. ambigua* Ehrenberg *N. bacillum* Ehrenberg *N. capitatoradiata* H.Germain *N. cryptocephala* Kützing *N. rhynchocephala* Kützing *N. seminulum* Grunow *N. veneta* Kützing *N. viridis* (Nitzsch) Ehrenberg

	S. capitata Ehrenberg *S. fasciculate*(C.Agardh) Kützing *S. rumpens* Kützing *S tenera* W.Smith *S. ulna* (Nitzs.) Ehrenberg *S. ulna var. biceps*(Kütz.) Schönfeldt *Tabellaria fenestrate*(Lyng.) Kützing
Chlorophyta	
	Actinastrium hantzschii Lagerheim *Ankistrodesmus falcatus* (Cord.) Ralfs *Asterococcus limneticus* G.M. Smith *A. superbus* (Cienk.) Scherffel *Carteria klebsii* (Dang.) Dill *Characium limneticum* Lemmermann *Chlamydomonas angulosa* Dill *C. globosa* Snow *Chlamydomonas sp* *Chlorella bejerinck* *Chlorella sp* *Closteriopsis longissima* Lemmermann *C. strigosum* Berb. *Coelastrum reticulatum* P.A.Dangeard *C. microporum* Nägeli Cosmarium botrytis Meneghinii *C.formosulum* Hoff *C. granatum* De Brébisson *C.subcostatum* Nordstedt *Cosmarium sp.* *Crucigenia vectangularis* (A. Braun) Gay. *Dactylococcopsis sp* *Eudorina elegans* Ehren *Geminella interrupta* (Turp.) Lagerheim *Gloeotrichia natans* (Hedwig) Rabenhorst *Kirchneriella controta* (Schmidle) Bohlin *Meringosphaera spinosa* prescot *Oedogonium cardiacum*(Hass.) Wittrock *Pediastrum simplex* Meyen *Pediastrum sp* *Sceneds quadricauda* (Turp.) de Brébisson *Scenedesmus armatus* Chodat *S. abundans var. brevicauda* G.M. Smith *S. aculeolatus* *S. arcuats* (Lemmermann) *S.bijuga* (Turb.)Lagher *S. ecorins* *S. quadricanda* *S. quadricanda var. Longispina* (Chod.) G.M. Smith *S.dimorphus* (Turb.)Ktz. *S. quadricauda* var westii *Selanastrum sp.* *Schizochlamys gelatinosa* A. Braun *Spirogyra scrobiculata* (Stock.) Czurda *Tetradesmus wisconsinense* G.M. Smith *Tetraedron hastatum*(Reisch)Hansg *T. minimum* (A. Braun Hansging

	Trochiscicia granulate (Reinsch) Hansging *Ulothrix sp.* *U. aequalis* Kuetzing *U. variabilis* Kuetzing *Volvox sp.* *Westella linearis* G.M. Smith *Zygnema sp.*
Cyanophyta	
	Anabaena sp. *Aphanocapsa rivularis* (Carm.) Rabenhorts *Arthrospira sp* *Calothrix sp.* *Chroococcus disperses* (keissl) Lemmerman *Chroococcus limneticus*Lemmermann *Chroococcus turgidus*(Ktz.)Naegeli *Gomphosphaeria aponina* Kützing *Lyngbya aestuarii* Lemmermann *Lyngbyanordgaardii* Wille *Lyngbya limnetica* Lemmermann *Lyngbya perelgeaus*Lemmerman *Lyngbya sp* *Merismopedia elegan* A.Braun *M. glauca*(Ehr.) Naegeli *M. punctata* Meyen *Nostoc sp*. *Oscillatoria agardhii* Gomont *O. amphibian*
	O. chalybea Mertens *O. Formosa* Bory *O. granulatan* Mertens *O. laete-virens* (Crouan)Gomont *O. limnetica* *O.ornate*(Ktz.) Gomont *f.planetonica* Elenkin *O. princeps* Agardh *O. sancta* (Ktz.) Gomont *O.subbervis* Schmidle *O. subliformis* Kutz *O. tenuis* Agardh *O.terebriformis* Agradh *O. sp.* *Phormidium subfuscum* Ktz. *P. sp* *Spirulina laxa* G.M. Smith *Spirulina major* Kützing *S. princes* (West and west) G.S. West *S. subsalsa* Oersted
Euglenophyta	
	Euglena acus Ehernberg *E. elongate* Schewiakoff *E. gracilis* Klebs *E. proxima* Dangeread *E. spirogyra* Ehernberg *Phacus caudatus* Huebner *P sp*.

	Trachelomonas acanthostoma(Stoken) De Flander
Dinophyta	
	Glenodinium pulvisculus (Ehr.)Stein *G. quadriden* *G.sp.*

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