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A check-List of marine Protista and Chromista reported from Pakistan

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Contribution: Conceptualization, writing, review and editing.

Abstract

The paper provides a list of recognized extant taxa with in biotic Kingdoms Protista and Chromista occurring in Pakistan coastal and deep sea waters.

Keywords: Protista, Chromista, list, Pakistan, marine.

Introduction

While preparing the marine faunal inventory of Pakistan I started my work with the marine Protozoa. Historically, protozoans were regarded as "one-celled animals "because they often possess animal-like behaviours, such as motility and predation. The taxon 'Protozoa' failed to meet monophyletic and holophyletic standards, so grouping Protozoa with animals, and treating them as closely related, became no longer justifiable. The term continues to be used in a loose way to describe single-celled protists. Ultimately the taxon Protozoa was applied to certain groups of eukaryotes, classified under Kingdom Protista with 4 other groups.

The kingdom Protista includes the eukaryotes that cannot be classified as plants, fungi or animals. Marine Protista are defined by their habitat in marine environments, both in the salt water of seas or oceans or the brackish water of coastal estuaries. Similarly Chromista, established in 1981, is a biological kingdom of unicellular or multicellular eukaryotic species such as algae, diatoms, oomycetes, and protozoans. Several major protist groups formerly treated as Protozoa really belong in the kingdom Chromista, comprising of eight distinctive phyla, the most specious being diatoms and foraminifera.

From Pakistan a lot of work has been done on both fossil and recent marine and fresh water species of these groups (See references); in some reports fresh water species are given in marine inventories, possibly they are halophytes; the other issue which needs to be taken up is that not all reported species in these reports are tropical, some are temperate and subtropical in distribution, it seems their ecology is diverse, with representatives of the genera present in coastal and inland waters from the tropics to the arctic. The fossil species given in literature from Pakistan are not included here.

Methods

For compilation I used a series of world's literature reporting these two kingdoms from Pakistan coast. Although all are taxonomically known species, but when found a change in nomenclature, I have given the updated name, according to new nomenclatural combination, along with the

firstly reported name marked in the list "as" below the updated species name. Where a topographical mistake is found in species name a corrected name is incorporated. For authoritative classification of marine names World Register of Marine Species (WoRMS) is mostly followed here. It happened, not too often, that I could not find a previously reported species in WoRMS catalogue e.g. *Pleurosigma olescurium*, hence they are not included in the checklist. In references in the end the explanations of taxonomic authority to the species are not cited.

The accepted names are kept in bold. The species are arranged alphabetically, as typically done, rather than following a strict hierarchical classification, this is to facilitate easier searching and data manipulation, and especially for those unfamiliar with the phylogeny of the taxa. Information on synonyms is also given.

Results

Check-List

Achnanthes brevipes C. Agardh, 1824
Actinocyclus octonarius var. ***octonarius*** Ehrenberg, 1837
(Latif *et al.,* 2013 as *Actinocyclus octonarius* Ehrenberg)
Actinocyclus senarius Ehrenberg, 1838
Adercotryma glomeratum (Brady, 1878)
Adoneispacifica Andrews and Rivera, 1987
Akashiwo sanguinea (Hirasaka, 1924) Gert Hansen and Moestrup, 2000
Alabaminella weddellensis (Earland, 1936)
(Schumacher *et al*., 2007 as *Eponides pusillus* Par)
Alexandrium andersonii Balech 1990
Alexandrium catenella (Whedon and Kof. 1936) Balech, 1985
Alexandrium concavum (Gaarder, 1954) Balech, 1985
Alexandrium ostenfeldii (Paulsen, 1904)
Alexandrium minutum Halim, 1960 Balechand Tangen, 1985
Alexandrium pseudogonyaulax (Biecheler, 1952) T. Horig., 1983 ex T. Kita and Fukuyo, 1992
Alexandrium tamarense (Lebour) Balech, 1995
Alexandrium taylorii Balech, 1994
Alliatina nitida (Millett, 1900)
(Erbacher and Nelskamp, 2006 as *Alliatina primitive*)
Ammodiscus tenuis (Brady, 1881)
Ammoglobigerina globulosa (Cushman, 1920)
(Shumacher *et al.*, 2007 as *Trochammina globulosa*)
Ammonia parkinsoniana (d'Orbigny, 1839)
Ammotium cassis (Parker, 1870)

Ammobaculites filiformis Earland, 1934

Amphicoryna scalaris (Batsch, 1791)

Amphora rostrata van Heurck, 1896 uncertain

Amphidinium carterae Hulburt, 1957

Amphisolenia bidentata Schröd.1900

Amylaxtria canthi (Jörg.) Sournia, 1984

Anaulus sp.

Anomalinoides globulosus (Chapman & Parr, 1937)
Asterigerina sp.
Asterionella bleakeleyi var. ***notata*** Grunow, 1867
(Hamid *et al.,* 2023 as *Bleakeleyanotata*)
Asterionella formosa Hassall, 1850
Asterionella glacialis Castracane,1886
(Naz *et al.,* 2013 as *Asterionellopsis glacialis* (Castracane) Round)
Asterionella japonica Cleve, 1882
Asteromphalus elegans Greville 1859
Asteromphalus heptactis (Brébisson) Ralfs, 1861
Asteromphalus roperianus (Greville) Ralfs, 1861
Astrononion echolsi Kennett, 1967
Aulacoseira granulata (Ehrenberg) Simonsen, 1979
Azadinium spinosum Elbr. and Tillmann, 2009
Azpeitia nodulifera (A.W.F.Schmidt) G.A. Fryxell and P.A. Sims, 1986
(Latif *et al.,* 2013 as *Coscinodiscus nodulifer* Schmidt)
Bachelotia antillarum (Grunow) Gerloff, 1959
Bacteriastrum comosum J. Pavillard, 1916
Bacteriastrum delicatulum Cleve, 1897
Bacteriastrum elongatum Cleve, 1897
Bacteriastrum hyalinum Lauder, 1864
Bacteriastrum minus Karsten, 1905
Bacteriastrum varians Hustedt 1929
Bellerochea malleus (Brightwell) Van Heurck 1885
Blepharocysta splendor-maris (Ehrenberg) F. Stein, 1883
Biddulphia biddulphiana (J.E. Smith) Boyer, 1900
(Al-Kandari *et al.,* 2009 as *Biddulphia pulchella)*
Biddulphia sinensis Greville, 1866
(Shoab *et al.,* 2017 as *Odentella sinensis*)
Bolivina dilatata Reuss, 1850
Bolivina pacifica Cushman & McCulloch, 1942
Bolivina spathulata (Williamson, 1858)
Bolivina subspinescens Cushman, 1922
Bolivinellina pseudopunctata (Höglund, 1947)
(Erbacher and Nelskamp, 2006 as *Bolivina pseudopunctata*)
Bulimina aculeata d'Orbigny, 1826
Bulimina marginata d"Orbigny, 1826
Bulimina truncana Gümbel, 1870
(Schumacher *et al*., 2007 as *Bulimina alazanensis* Cushman)
Cancris auricula (Fichtel & Moll, 1798)
(Schumacher *et al*., 2007 as *Cancris auriculus* (Fichtel & Moll))
Canistrocarpus cervicornis (Kützing) De Paula & De Clerck, 2006
(Begum and Khatoon, 1988 as *Dictyota cervicornis* Kützing and *Dictyota divaricata* (J. Agardh) J. Agardh)
Cassidulina laevigatad' Orbigny, 1826
Centrodinium elongatum Kofoid, 1907
Cerataulina bergonii Ostenfeld, 1903
(Khokar *et al.,* 2016 as *Cerataulinapelagica* (Cleve) Hendey)
Ceratoperidinium falcatum (Kof.andSwezy) Reñéand de Salas, 2013
Ceratium breve f. ***parallelum*** (Schmidt) Jorgensen, 1911
Ceratium hirundinella (O.F. Müll) Dujard. 1841
Chaetoceros affinis Lauder, 1864

Chaetoceros anastomosans Grunow, 1882
Chaetoceros aequatorialis Cleve, 1873
Chaetoceros atlanticus Cleve, 1873
Chaetoceros atlanticus var.***neapolitanus*** (Schroeder) Hustedt, 1930
Chaetoceros borealis Bailey, 1854
Chaetoceros brevis F. Schütt, 1895
Chaetoceros castracanei Karsten, 1905
Chaetoceros coarctatus Lauder, 1864
Chaetoceros compressus Lauder, 1864
Chaetoceros constrictus Gran, 1897
(Latif *et al.,* 2013 as *C. constrictum* Gran)
Chaetoceros convolutes Castracane, 1886
Chaetoceros costatus Pavillard , 1911
Chaetoceros criophilum Castracane, 1886
(Hamid *et al.,* 2023 as Cheatoceros criopillus)
Chaetoceros curvisetus Cleve, 1889
Chaetoceros danicus Cleve, 1889
Chaetoceros decipiens Cleve, 1873
(Tabassum and Saifullah, 2010 as *Chaetocerose decipience*)
Chaetoceros densus (Cleve) Cleve, 1899
Chaetoceros denticulata H.S. Lauder, 1864
Chaetoceros diversus Cleve, 1873
Chaetoceros eibenii Grunow, 1882
Chaetoceros externus Gran, 1897
Chaetoceros granii (Cleve) Nomen, 1899
Chaetoceros laciniosus F. Schütt, 1895
Chaetoceros lauderi Ralfs, 1864

Chaetoceros lorenzianus Grunow, 1863
Chaetoceros messanense Castracane, 1875

(Tabassum and Saifullah, 2010 as *Chaetoceros messanensis* Castracan)
Chaetoceros neglectus Karsten, 1905
Chaetoceros pelagicus Cleve, 1873
Chaetoceros peruvianus Brightwell, 1856
Chaetoceros peruvianus var***. robustum*** (Cleve, 1873)
(Tabassum and Saifullah, 2010 as *Chaetoceros peruvianus* var*. robusta* Cleve)
Chaetoceros pseudocurvisetus Mangin, 1910
Chaetoceros pseudosymmetricus Mangin, 1910
Chaetoceros radicans F. Schütt, 1895
Chaetoceros socialis H.S. Lauder, 1864
Chaetoceros teres Cleve, 1896
Chaetoceros willei Gran, 1897
(Tabassum and Saifullah, 2010 as *C.affinis* var. *willei* Laude)
Cibicidoides mundulus (Brady, Parker & Jones, 1888)
(Schumacher *et al*., 2007 as *Cibicides kullenbergi* Parker)
Climacosphenia sp
(Luqman *et al.,* 2013 as *Climacosphaenia* sp.)
Climacodium frauenfeldianum Grunow, 1868
Cocconeis convexa M.H. Giffen, 1967
Coenobiodiscus muriformis Loeblich III, Wight and Darley, 1968
(Tabassum and Saifullah, 2010 as *Planktoniella muriformis* (Loeblich,Wight and Darley)
Cochlodinium polykrikoides Margalef, 1961

Colpomenia ecuticulata M.J. Parsons, 1982
Colpomenia sinuosa (Mertens ex Roth) Derbès & Solier, 1851
Corethron criophilum Castracane, 1886
Coscinodiscopsis jonesiana (Greville) Sar & Sunesen, 2008
(Latif *et al.,* 2013 as *C. jonesianus* (Greville) Ostenfeld)
Coscinodiscus argus Ehrenberg, 1839
Coscinodiscus asteromphalus Ehrenberg, 1844
Coscinodiscus centralis Ehrenberg, 1844
Coscinodiscus concinnus W. Smith, 1856
Coscinodiscus gigas Ehrenberg, 1841
Coscinodiscus granii Gough, 1905
Coscinodiscus lineatus Ehrenberg, 1841
Coscinodiscus marginatus Ehrenberg, 1844
Coscinodiscus nitidus Gregory, 1857
Coscinodiscus oculus-iridis (Ehrenberg) Ehrenberg, 1840
Coscinodiscus radiatus Ehrenberg, 1840
Coscinodiscus sol C.G. Wallich, 1860
(Tabassum and Saifullah, 2010 as *Planktoniella sol* (Wallich) Schütt)
Coscinodiscus subtilis Ehrenberg, 1841
Coscinodiscus wailesii Gran and Angst, 1931
Cribrostomoides jeffreysii (Williamson, 1858)
Cribrostomoides nitidus (Goës, 1896)
(Schumacher *et al.,* 2007 as *Cribrostomoides* cf. *nitidum* (Goës)
Cribrostomoides subglobosus (Cushman, 1910)
Cribrostomoides wiesneri (Parr, 1950)
Cyclammina cancellata Brady, 1879
Cyclotella comta (Ehrenberg) Kützing, 1849
Cyclotella dubia var. ***dubia*** Fricke in Schmidt *et al*., 1900
(Latif *et al*., 2013 as *Cyclostephanosdubius* (Hustedt) Round)
Cyclotella cf. ***meneghiniana*** Kützing, 1844
Cylindrotheca closterium (Ehrenberg) Reimann and Lewin, 1964
Cylindrotheca fusiformis Reimannand Lewin, 1964
Cymatosira acremonica Schrader, 1969
Cymatosira lorenziana Grunow, 1862
Dactyliosolen sp
Derbesia marina (Lyngbye) Solier, 1846
(Nizamuddin, 1968 as *Vaucheria marina*)
Deuterammina grahami Brönnimann &Whittaker, 1988
Dictyopteris acrostichoides (J. Agardh) Bornet, 1885
Dictyopteris australis (Sonder) Askenasy, 1888
Dictyopteris delicatula J.V. Lamouroux, 1809
Dictyopteris divaricata (Okamura) Okamura, 1932
Dictyopteris polypodioides (De Candolle) Lamouroux, 1809
(Begum and Khatoon, 1988 as *Dictyopteris tripolitana* Nizamuddin)
Dictyopteris repens (Okamura) Børgesen, 1924
Dictyota bartayresiana J.V. Lamouroux, 1809
Dictyota ceylanica Kützing, 1859
Dictyota ciliolata Sonder ex Kützing, 1859

(Begum and Khatoon, 1988 as *Dictyota ciliata* J. Agardh and as *Dictyota maxima* Zanardini)
Dictyota dichotoma (Hudson) J.V. Lamouroux, 1809
Dictyota dichotoma var. ***intricata*** (C.Agardh) Greville, 1830
Dictyota dumosa Børgesen, 1935
Dictyota fasciola (Roth) J.V. Lamouroux, 1809
(Begum and Khatoon, 1988 as *Dilophus fasciola* (Roth) M.A. Howe)
Dictyota hauckiana Nizamuddin, 1975
Dictyota implexa (Desfontaines) J.V. Lamouroux, 1809
(Begum and Khatoon, 1988 as *Dictyota dichotoma*; Abbas and Shameel, 2012 as *Dictyota linearis* (C. Agardh) Greville)
Dictyota indica Anand, 1965 uncertain
Dinophysis acuminata Clap and Lachm, 1859
Dinophysis acuta Ehrenb, 1839
Dinophysis argus (Stein) Abé, 1967
(Gul and Saifullah, 2010 as *Phalacroma argus* Stein)
Dinophysis caudata Saville-Kent, 1881
Dinophysis fortii Pavill, 1923
(Gul and Saifullah, 2010 as *Dinophysis ovum*)
Dinophysis infundibulus Schiller, 1928
Dinophysis hastata F. Stein, 1883
Dinophysis miles Cleve, 1900
Dinophysis phalacromoides (Jørg. 1923)
Dinophysis schuettii Murray and Whitting, 1899
Diploneis smithii (Brébisson) Cleve, 1894
Diplopsalopsis bomba (Stein, 1883)
Diplopsalopsis orbicularis (Paulsen) Meunier, 1910
Ditylum brightwellii (T. West) Grunow, 1885
Ditylum sol (Grunow) De Toni, 1894
Druridgea sp.
Ectocarpus rallsiaeVickers, 1905
(Begum and Khatoon, 1988 as *Hincksia rallsiae* (Vickers) P.C. Silva)
Eggerelloides scabrum (Williamson, 1858)
Eilohedra vitrea (Parker, 1953)
Encephalophycus tuberculatus (D.A.Saunders) Santiañez, 2022
(Anand, 1940 as *Colpomenia sinuosa* f.*tuberculata* (D.A. Saunders) Setchelland N.L. Gardner)
Entomoneis alata (Ehrenberg) Ehrenberg, 1845
Epistominella exigua (Brady, 1884)
Eratidus foliaceus (Brady, 1881)
(Schumacher *et al.,* 2007 as *Ammomarginulina foliacea* (Brady)
Eubuliminella exilis (Brady, 1884)
(Erbacher and Nelskamp, 2006 as *Buliminella tenuata*; Cushman, Schumacher, 2007 as *Buminella exilis* (Brady)
Eubuliminella morgana (Andersen, 1961)
(Erbacher and Nelskam, 2006 as *Buliminella morgana*)
Eucampia cornuta (Cleve) Grunow, 1883
Eucampia groenlandica Cleve 1896
Eucampia zodiacus Ehrenberg, 1839
Eucampia zodiacus f. ***cylindrocornis*** Syvertsen in Syvertsen and Hasle, 1983
(Tabassum and Saifullah, 2010 as *Eucampia cylindricornis*)
Eupodiscus jonesianus Greville, 1862

(Tabassum *et al.,* 2013 as *Coscinodiscus jonesianus* (Greville) Ostenfeld)
Exilaria flabellata Ehrenberg, 1832
(Hamid *et al.,* 2023 as *Licmophora flabellata*)
Evolvocassidulina bradyi (Norman, 1881)
(Schumacher *et al.,* 2007 as *Cassidulinoides bradyi* (Norman)
Feldmannia columellaris (Børgesen) Islam, 1976
(Aisha, 2017 as *Ectocarpus columellaris* Børgesen, 1936)
Feldmannia filifera (Børgesen) P.H.Hô, 1969
(Aisha, 2017 as *Ectocarpus filifer* Børgesen)
Feldmannia indica (Sonder) Womersley and A.Bailey, 1970
Feldmannia irregularis (Kützing) Hamel, 1939
Feldmannia mitchelliae (Harvey) H.S. Kim, 2010
(Begum and Khatoon 1988 as *Hincksia mitchelliae* (Harvey) Silva)
Feldmannia simplex (P. Crouan & H. Crouan) Hamel, 1939
(Begum and Khatoon, 1988 as *Ectocarpus cylindricus* DeA. Saunders)
Fragilaria unipunctata Lyngbye, 1819
(Hamid *et al.,* 2023 as *Striatella unipunctata*)
Gambierdiscus toxicus Adachi and Fukuyo, 1979
Gavelinopsis praegeri (Heron-Allen & Earland, 1913)
(Schumacher *et al.,* 2007 as *Gavelinopsis lobatulus* (Parr)
Giffordiaduchassaingiana (Grunow) W.R. Taylor1960
(Shameel and Khan, 2011 as *Ectocarpusduch assaingianus* Grunow)
Globigerina bulloides d'Orbigny, 1826
Globigerina falconensis Blow, 1959
Globobulimina affinis (d'Orbigny, 1839)
Globobulimina pyrula (d'Orbigny, 1846)
Globobulimina turgida (Bailey, 1851)
Globocassidulina subglobosa (Brady, 1881)
Glomospira gordialis (Jones &Parker, 1860)
Gonyaulax ceratocoroides Kof. 1910
Gonyaulax diegensis Kof. 1911
Gonyaulax digitalis (Pouchet, 1883) Kof. 1911
Gonyaulax monacantha Pavill. 1916
Gonyaulax polygramma Stein, 1883
Gonyaulax turbynei Murray and Whitting, 1899
Gonyaulax verior Sournia, 1973
Gossleriella tropica Schütt, 1892
Gromia pyriformis Gooday and Bowser, 2005
Gromia sphaerica Gooday, Bowser, Bettand Smith, 2000
Guinardia flaccida (Castracane) H. Peragallo, 1892
Guinardia striata (Stolterfoth) Hasle, 1996
Gymnodinium catenatum Graham, 1943
Gymnodinium filum Lebour, 1917
Gyroidina altiformis Stewart & Stewart, 1930
Gyroidina orbicularis d'Orbigny in Parker, Jones & Brady, 1865
Gyroidina polia (Phleger & Parker, 1951)

(Schumacher *et al.,* 2007 as *Gyroidinoides polius* (Phleger & Parker)
Gyrodinium spirale (Bergh) Kofoid & Swezy, 1921
Gymnodinium simplex Dang. 1939
Gyrodinium varians (A. Wulff 1916) Schiller, 1933
Gyrosigma balticum (Ehrenberg) Rabenhorst, 1853
Gyrosigma fasciola (Ehrenberg) J.W.Griffith & Henfrey, 1856
Pleurosigma balticum var. ***constrictum*** Grunow in Cleve & Grunow, 1880
(Saifullah and Chaghtai, 1993 as *Gyrosigma diminutum* var. *constricta* (Grunow in Cleve & Grunow) Cleve; Naz *et al.,* 2012 as *Pleurosigma balticum* (Ehrenberg) W.Smith)
Pleurosigma peisonis var. ***peisonis*** Grunow, 1860
(Saifullah and Chaghtai, 1993 as *Gyrosigma peisonis*)
Gyrosigma spencerii Cleve, 1895 uncertain
Gyrosigma wansbeckii (Donkin) Cleve, 1894
Halamphora coffeiformis (C. Agardh) Levkov, 2009
Haplophragmoides sphaeriloculum Cushman, 1910
(Schumacher *et al.,* 2007 as *Haplophragmoides sphaeriloculus*)
Haslea trompii (Cleve) Simonsen, 1974
Haslea wawrikae (Hustedt) Simonsen, 1974
Hemiaulus hauckii Grunowex VanHeurck, 1882
Hemiaulus indicus Karsten, 1907
Hemiaulus membranaceus Cleve, 1873
Hemiaulus sinensis Greville, 1865 uncertain
Hemidiscus kanayanus Simonsen, 1972.
Heterocapsa circularisquama Horig, 1995
Heterocapsa triquetra (Ehrenb. 1840) Stein, 1883
Hecatonema enhali (Børgesen) Balakrishnan and Kinkar, 1981 (Aisha, 2017 as *Ectocarpus enhali* Børgesen)
Hincksia conifer (Børgesen) I.A. Abbott, 1989
Hincksia granulosa (Smith) P.C. Silva, 1987
Hincksia nizamuddinii Aisha and Shameel, 2011 uncertain
Histioneis biremis Stein, 1883
Histioneis crateriformis Stein, 1883
Histioneis elongata Kofoid and Michener, 1911
Histioneis longicollis Kofoid, 1907
Histioneis megalocopa Stein, 1883
(Gul and Saifullah, 2010 as *Histioneis dolon* Murray and Whitting)
Hobaniella longicruris (Greville) Sims and Williams in Sims *et al*., 2018
(Hamid *et al.,* 2023 as *Odentellalongicruris*) Hormosinasp
Hormosinella distans (Brady, 1881)
Hormosinella gracilis (Earland, 1933)
(Schumacher *et al.,* 2007 as *Reophax gracilis* Earland)
Hormosinelloides guttifer (Brady, 1881)
(Schumacher *et al.,* 2007as *Reophaxguttifer*)
Hyalinea balthica (Schröter, 1783)
Hyalodiscus radiatus (O'Meara) Grunow, 1880
Hydroclathrus clathratus (C. Agardh) M. Howe, 1920

Ioanella tumidula (Brady, 1884)
Iyengaria stellata (Børgesen) Børgesen, 1939
Jolyna laminarioides S.M. Guimarães, 1986
Karenia brevis (Davis, 1948) Gert Hansen and Moestrup, 2000
Karenia mikimotoi (Miyake and Kominamiex Oda, 1935)
Kuetzingi ellaelachistaeformis (Heydrich) M. Balakrishnan and Kinkar, 1981
(Aisha, 2017 as *Ectocarpus elachistaeformis* Heydrich)
Laevidentalina filiformis (d'Orbigny, 1826)
(Schumacher *et al.,* 2007 as *Dentalina filiformis*)
Lagenammina ampullacea (Brady, 1881)
Lagenammina difflugiformis (Brady, 1879)
Lauderia annulata Cleve, 1873 uncertain
Lauderia borealis Gran, 1900
Lauderia schroederi Bergon, 1902
(Harrison *et al.,* 1997 as *Schroederellas chroederi* (Bergon) Pavillard
Lennoxia faveolata H.A. Thomsen and K.R. Buck, 1993
Lenticulina calcar (Linnaeus, 1758)
Lepidodinium chlorophorum (Elbr.and Schnepf, 1996) Gert Hansen, L. Botes, deSalas
Leptocylindrus danicus Cleve, 1889
(Hamid *et al.,* 2023 as *Leptocylindrus danicens*)
Leptocylindrus mediterraneus (H. Peragallo) Hasle, 1975
Leptocylindrus minimus Gran, 1915
Licmophora paradoxa (Lyngbye) C. Agardh, 1828
Lingulaulax polyedra (F. Stein) M.J. Head, K.N. Mertens & R.A. Fensome, 2024
(Latif *et al.,* 2023 as *Gonyaulax polyedra)*
Lobophora prostrata Aisha & Shameel, 2012
Lobophora variegata (Lamouroux) Womersley ex Oliveira 1977
Margalefidinium fulvescens (Iwataki, Kawami & Matsuoka) Gómez, Richlen & Anderson, 2017
(Munir *et al.,* 2012 as *Cochlodinium fulvescens* M. Iwataki, H. Kawami & K. Matsuoka)
Marginulina obesa Cushman, 1923
Melonisza andami VanVoorthuysen, 1952)
Melosira arctica Dickie, 1852
Melosira discigera Agardh, 1824
(Hamid *et al.,* 2023 as *Melosira nummuloides* Agardh)
Melosira moniliformis (O.F. Müller) C. Agardh, 1824
Mesodinium rubrum (Lohmann, 1908)
Navicula cancellata Donkin, 1872
Navicula directa (W. Smith) Brébisson, 1854
Navicula fastuosa Ehrenberg, 1840
(Shoab *et al.,* 2017 as *Surirella fastuosa*)
Navicula septentrionalis Cleve, 1896
Navicula transitans Cleve, 1883
(Naz, 2019 as *Navicula transitranse*)
Navicula transitans var. ***derasa*** Heimdal, 1970
Navicula septentrionalis Cleve, 1896
Navicula vanhoeffenii Gran, 1897
Nemacystus decipiens (Suringar)

Kuckuck, 1929
Neocalyptrella robusta (G. Normanex Ralfs) Hernández-Becerril and Meavedel Castillo, 1997
Neolenticulina variabilis (Reuss, 1850)
Neomoelleria cornuta (Cleve) S.Blanco and C.E. Wetzel, 2016 (Tabassum and Saifullah, 2010 as *Eucampia cornuta* (Cleve) Grunow)
Nitzschia acicularis (Kützing) W. Smith, 1853
Nitzschia angularis W. Smith, 1853
Nitzschia closterium (Ehrenberg) W. Smith, 1853
Nitzschia dissipata (Kützing) Rabenhorst, 1860
Nitzschia insignis Gregory, 1857
Nitzschia longissima (Brébisson) Ralfs, 1861
(Naz, 2012 as *Pseudonitzschia longissima*; Naz *et al.,* 2014 as *Nitzschia logissima*)
Nitzschia lorenziana Grunow, 1879
Nitzschia linearis W. Smith 1853
Nitzschia obtusa W. Smith, 1853
Nitzschia sigma (Kützing) W. Smith, 1853
Nitzschia socialis var. ***socialis*** Gregory, 1857
Nitzschia subpacifica Hasle, 1965
Nitzschia sigmoidea (Nitzsch) W. Smith, 1853
Nitzschia ventricosa Kitton, 1873
Nizamuddinia zanardinii Schiffner) Silva Nizamuddin *et al*., 1993
(Nizamuddin *et al*., 1993 as *Sargassopsis zanardinii*)
Noctiluca scintillans (Macartney, 1810) Kofoid and Swezy, 1921
Nodulina dentaliniformis (Brady, 1881) (Schumacher *et al.,* 2007 as *Reophax dentaliniformis* (Brady)
Nonion faba (Fichtel & Moll, 1798) (Schumacher *et al.,* 2007 as *Nonion fabum* (Fichtel & Moll))
Oblea rotunda (Lebour, 1922)
Octactis octonaria (Ehrenberg) Hovasse, 1946
Odontella aurita (Lyngbye) C. Agardh, 1832
Odontella longicruris (Greville) M.A.Hoban, 1983
Odontella mobiliensis (J.W. Bailey) Grunow, 1884
Odontella regia (Schultze) Simonsen, 1974
Ornithocercus magnificus Stein, 1883
Ornithocercus steinii F. Schütt, 1900
Osangularia culter (Parker & Jones, 1865)
Ostreopsis ovata Fukuyo, 1981
Oxytoxum curvatum (Kof. 1907)
Oxytoxum longum Schiller, 1937
Oxytoxum sceptrum (Stein, 1883) Schröd. 1906
Oxytoxum scolopax Stein, 1883
Padina afaqhusainii Aisha and Shameel, 2010
Padina antillarum (Kützing) Piccone, 1886
Padina boergesenii Allender & Kraft, 1983
Padina boryana Thivy, 1966
(Begum and Khatoon, 1988 as *Padina tenuis* BorydeSaint-Vincent)
Padina fraseri (Greville) Greville, 1830
Padina gymnospora (Kützing) Sonder 1871
Padina nizamuddinii Aisha et Shameel, 2010

Padina pavonica (Linnaeus) Thivy, 1960
(Begum and Khatoon, 1988 as *Padina pavonia* (Linnaeus) J.V. Lamouroux)
Padina sanctae-crucis Børgesen, 1914
Padina tetrastromatica Hauck, 1887
Padina vickersiae Hoyt, 1920
Paralia sulcata (Ehrenberg) Cleve, 1873
Paratrochammina challenger Brönnimann &Whittaker, 1988
Pauliella taeniata (Grunow) F.E. Round and P.W. Basson, 1997
(Hamid *et al.,* 2023 as *Achnanthes taeniata*)
Pelosina sp.
Peridinium truncatum O. Zacharias, 1903
Petalonia binghamiae (J. Agardh) Vinogradova, 1973
(Aisha, 2017 as *Endarachne binghamiae* J. Agardh)
Phalacroma doryphorum Stein, 1883
Phalacroma expulsum (Kofoid and Michener) Kofoid and Skogsberg, 1928
(Gul and Saifullah, 2010 as *Dinophysis expulse*)
Phalacroma favus Kofoid and Michener, 1911
Phalacroma mitra Schütt, 1895
Phalacroma ovum Schütt, 1895
Phalacroma rapa Jorgensen, 1923
Phalacroma rotundatum (Clap. and J. Lachm. 1859)
(Gul and Saifullah, 2010 as *Phalacroma rotundata*)
Pinnularia ambigua var. ***ambigua*** Cleve, 1895
(Saifullah and Chaghtai, 1993 as *Navicula retusa*)
Pinnularia distans W. Smith, 1853
(Khokar *et al.,* 2013 as *Navicula distans*)
Pinnularia viridis (Nitzsch) Ehrenberg, 1843
Planktoniella blanda (A. Schmidt) Syvertsen and Hasle, 1993
Planktoniella blanda var.***bilobata*** Tabassum and Saifullah, 2012
Pleurosigma acutum Norman ex Ralfs, 1861
Pleurosigma affine f. ***affine*** Grunow in Cleve and Möller, 1879
Pleurosigma angulatum (Queckett) W.Smith, 1852
Pleurosigma delicatulum var. ***salinarum*** Grunow, 1878
(Naz *et al.,* 2012 as *Pleurosigma salinarum* var. *pusilla* (Grunow) Cleve)
Pleurosigma directum Grunow, 1880
Pleurosigma decorum W. Smith, 1853
Pleurosigma elongatum W. Smith, 1852
Pleurosigma formosum W. Smith, 1852
Pleurosigma obscurum W. Smith 1852
Pleurosigma macrum W. Smith, 1853
Pleurosigma normanii Ralfs, 1861
Pleurosigma spenceri (Bailey ex Quekett) W. Smith, 1856
Pleurosigma strigosum W. Smith, 1852
Pleurosigma tenuissimum var. ***tenuissimum*** W. Smith, 1853
(Tabassum, 2016 as *P. tenuissimum* W. Smith)
Podosira stelligera (Bailey) A. Mann, 1907
Podolampas bipes F. Stein, 1883
Podolampas palmipes F. Stein, 1883
Polycladia indica (Thivy & Doshi) Draisma, Ballesteros, F. Rousseau & T. Thibaut, 2010
(Shaikh and Shameel, 1995 as *Stokeyia indica* Thivy et Doshi)

Porosira glacialis (Grunow) Jörgensen, 1905
Portatrochammina karica (Shchedrina, 1946)
(Schumacher *et al.,* 2007 as *Portatrochammina bipolaris* Brönnimann & Whittaker))
Proboscia alata (Brightwell) Sundström, 1986
(Naz *et al.,* 2012 as *Rhizosolenia alata*)
Pronoctiluca pelagica Fabre-Dom., 1889
Pronoctiluca spinifera (Lohmann, 1920) Schiller, 1933
Prorocentrum arcuatum Issel, 1928
Prorocentrum balticum (Lohmann, 1908) Loebl. 1970
Prorocentrum compressum (Bailey, 1851)
Prorocentrum concavum Fukuyo, 1981
Prorocentrum dentatum Stein, 1883
Prorocentrum donghaiense Luin Lu and Goebel, 2001
Prorocentrum emarginatum Fukuyo, 1981
Prorocentrum faustiae Morton, 1998
Prorocentrum formosum Faust, 1993
Prorocentrum gracile Schütt, 1895
Prorocentrum lima (Ehrenb.1860) Dodge, 1975
Prorocentrum mexicanum B.F. Osorio, 1942
Prorocentrum micans Ehrenb, 1834
Prorocentrum minimum (Pavill, 1916) Schiller, 1931
Prorocentrum redfieldii Bursa, 1959
Prorocentrum rhathymum Loeblich III, Sherley and Schmidt, 1979
Prorocentrum rostratum Stein, 1883
Prorocentrum triestinum Schiller, 1918
Protoceratium reticulatum (Clap. and J. Lachm, 1859) Buetschli, 1885
Protoglobobulimina pupoides (d'Orbigny, 1846)
(Schumacher *et al.,* 2007 as *Praeglobobulimina pupoides* (d'Orbigny)
Protoperidinium abei (Paulsen, 1930) Balech, 1974
(Hassan and Saifullah1972 as *Peridinium abei*)
Protoperidinium bipes (Paulsen, 1904) Balech, 1974
Protoperidinium brevipes (Paulsen, 1908) Balech, 1974
Protoperidinium cerasus (Paulsen, 1907) Balech, 1973
Protoperidinium claudicans (Paulsen, 1907) Balech, 1974
Protoperidinium concavum (L. Mangin, 1926) Balech, 1974 ***Protoperidinium conicum*** (Gran, 1900) Balech, 1974
(Durreshawar and Saifullah, 1972 as *Peridinium conicum*)
Protoperidinium crassipes (Kof. 1907) Balech, 1974
Protoperidinium curtipes (Jørg. 1912) Balech, 1974
Protoperidinium depressum (Bailey, 1854)
(Hassan and Saifullah, 1972 as *Peridinium depressum*)
Protoperidinium divergens (Ehrenb. 1841)
Protoperidinium elegans (Cleve, 1900) Balech, 1974
Protoperidinium excentricum (Paulsen, 1907)
Protoperidinium grahamii (Sournia, 1973) Balech, 1994

(Hassan and Saifullah, 1972 as *Peridinium truncatum* H.W. Graham)
Protoperidinium hirobis (T.H. Abé, 1927) Balech, 1974
(Hassan and Saifulla, 1972 as *Peridinium hirobis*)
Protoperidinium leonis (Pavill, 1916) Balech, 1974
Protoperidinium longipes Balech, 1974
Protoperidinium oblongum (Auriv, 1898)
(Hassan and Saifullah, 1972 as *Peridinium oblongum*)
Protoperidinium oceanicum (Vanhöffen, 1897)
(Hassan and Saifullah, 1972 as *Peridinium oceanicum*)
Protoperidinium ovatum C.H.G. Pouchet, 1883
(Hassan and Saifullh.1973 as *Peridinium ovatum*)
Protoperidinium oviforme (P.A. Dangeard, 1927)
Protoperidinium pallidum (Ostenf, 1899) Balech, 1974
Protoperidinium pellucidum Bergh, 1882
Protoperidinium pentagonum (Gran, 1902) Balech, 1974
(Hassan and Saifullah, 1972 as *Peridinium pentagonum*)
Protoperidinium punctulatum (Paulsen, 1908) Balech, 1974
Protoperidinium pyriforme (Paulsen, 1907)
Protoperidinium robustum (Meunier, 1910)
Protoperidinium solidicorne (L. Mangin, 1922) Balech, 1974
Protoperidinium steinii (Jørg. 1899)
(Hassan and Saifulla, 1972 as *Peridinium steinii*)
Protoperidinium subinerme (Paulsen, 1904)
Protoperidinium tenuissimum (Kof. 1907) Balech, 1974
Protoperidinium thorianum (Paulsen, 1905) Balech, 1973
Protoperidinium ventricum (Abé, 1927)
Pseudophalacroma nasutum (Stein, 1883)
Pseudo-nitzschiaaustralis Frenguelli, 1939
Pseudo-nitzschiadelicatissima (Cleve) Heiden, 1928
Pseudo-nitzschia fraudulenta (Cleve) Hasle, 1993
Pseudo-nitzschia granii (Hasle, 1993)
(Hasle, 1993 as *Pseudonitzschia granii* var. *granii)*
Pseudo-nitzschia heimii Manguin, 1957
Pseudo-nitzschia lineola (Cleve) Hasle, 1965
Pseudo-nitzschia multiseries (Hasle) Hasle, 1995
(Hamid *et al.,* 2023 as *Nitzschia multiseries*)
Pseudo-nitzschia prolongatoides (Hasle) Hasle, 1993
Pseudo-nitzschia pseudo delicatissima (Hasle) Hasle, 1993
Pseudo-nitzschia cf***. pungens*** (Grunowex Cleve) Hasle, 1993
Pseudo-nitzschia seriata (Cleve) Peragallo, 1899
Pseudo-nitzschiasubcurvata (Hasle) Fryxellin Hasle, 1993
Pseudo-nitzschia subfraudulenta (Hasle) Hasle, 1993
Pseudo-nitzschia turgidula (Hustedt)

Hasle, 1993
(Hamid *et al.,* 2023 as *Nitzschia turgidula*)
Pseudoguina rdiarecta von Stosch, 1986
Pseudonodosinellaelongata (Grzybowski, 1898)
(Shumacher *et al.,* 2007 as *Reophax mortenseni* (Hofker)
Pseudosolenia calcar-avis (Schultze) Sundström, 1986
Pullenia bulloides (d'Orbigny, 1846)
Pullenia quinqueloba (Reuss, 1851)
Pyrocystis fusiformis (Thomson, 1876 ex Haeckel, 1890)
Pyrocystis lunula (F. Schütt, 1895) Schütt, 1896
Pyrocystis obtusa Pavillard, 1931
Pyrocystis noctiluca J. Murray, 1885
Pyrocystis robusta Kofoid, 1907
Pyrophacus horologium F. Stein, 1883
Pyrophacus steinii (J. Schiller, 1935) Wall and Dale, 1971
Quinqueloculina laevigata d'Orbigny, 1839
Recurvoides contortus Earland, 1934
Recurvoides turbinatus (Brady, 1881)
Reophax agglutinatus Cushman, 1913
Reophax bilocularis Flint, 1899
Reophax fusiformis (Williamson, 1858)
Reophax micaceus Earland, 1934
Reophax pilulifer Brady, 1884
Reophax scorpiurus Montfort, 1808
Reussella spinulosa (Reuss, 1850)
Rhizosolenia acuminata (H. Peragallo) H. Peragallo, 1907
Rhizosolenia bergonii H. Peragallo, 1892
Rhizosolenia calcar-avis Schultze, 1858
Rhizosolenia castracanei H. Peragallo1888
Rhizosolenia clevei var. ***clevei*** Ostenfeld, 1902
Rhizosolenia clevei var. ***communis*** Sundström, 1984
Rhizosolenia crassispina Schroder, 1906
Rhizosolenia crassa Hensen, 1911
Rhizosolenia crassispina Schroder, 1906
Rhizosolenia cylindrus Cleve, 1897
(Tabassum and Saifullah, 2012 as *Guinardia cylindrus* (Cleve) Hasle)
Rhizosolenia delicatula Cleve, 1900
(Tabassum *et al.,* 2012 as *Guinardia delicatula*)
Rhizosolenia fallax B.G. Sundström, 1986
Rhizosolenia firma Karsten, 1907
Rhizosolenia formosa H. Peragallo 1888
Rhizosolenia fragilissima f. ***fragilissima*** Bergon, 1903
(Tabassum and Saifullah, 2015 as *Dactyliosolen fragilissimus* (Bergon & Hasle)
Rhizosolenia hebetata Bailey, 1856
Rhizosolenia hyalina Ostenfeld, 1901
Rhizosolenia imbricata Brightwell, 1858
Rhizosolenia indica H. Peragallo, 1892
(Tabassum and Saifullah, 2010 as *Proboscia indica* (Peragallo) Hernandez-Becerril emend. Jordan and Ligowski)
Rhizosolenia longiseta O. Zacharias 1893
Rhizosolenia phuketensis B.G. Sundström, 1980
(Tabassum and Saifullah, 2010 as

Dactyliosolen phuketensis (B.G. Sundström)
Rhizosolenia robusta G. Normanex Ralfs, 1861
Rhizosolenia semispina Hensen, 1887 (Tabassum and Saifullah, 2011 as *Rhizosolenia hebetate* f. *semispina* (Hensen) Gran)
Rhizosolenia setigera f. ***setigera*** Brightwell, 1858
Rhizosolenia setigera f. ***pungens*** (Cleve-Euler) Brunel, 1962.
Rhizosolenia simplex Karsten, 1905
Rhizosolenia shrubsolei Cleve, 1881
Rhizosolenia stolterfothii Peragallo, 1888
Rhizosolenia striata Greville, 1864
Rhizosolenia styliformis Brightwell, 1858
Rosenvingea fastigiata (Zanardini) Børgesen, 1914
Rosenvingea orientalis (J. Agardh) Børgesen, 1914
Rotaliammina squamiformis (Cushman & McCulloch, 1939)
Rutherfordoides rotundatus (Parr, 1950)
(Schumacher *et al.,* 2007 as *Rutherfordoides rotundata* (Parr)
Rutherfordoides mexicanus (Cushman, 1922)
(Schumacher *et al.,* 2007 as *Fursenkoina mexicana* (Cushman)
Saracenaria latifrons (Brady, 1884)
Sargassum tenerrimum J. Agardh, 1848
Scrippsiella acuminata (Ehrenb. 1836)
Scrippsiella spinifera G. Honsell and M. Cabrini, 1991
Skeletonema costatum (Greville) Cleve, 1866
Sigmoilopsis schlumbergeri (Silvestri, 1904)
Siphouvigerina proboscidea (Schwager, 1866)
(Schumacher *et al.,* 2007 as *Uvigerina proboscidea)*
Spatangidium flabellatum Brébisson, 1857
(Moazzam and Saifullah, 1978 as *Asteromphalus flabellatus*)
Spatoglossum asperum J. Agardh 1894
Spatoglossum schroederi (Agardh) Kützing, 1859
Figari and DeNotaris, 1853
Spirillina vivipara Ehrenberg, 1843
Spiroplectammina biformis (Parker and Jones, 1865)
Spirosigmoilina tenuis (Čžjžek, 1848)
Spongonema tomentosum (Hudson) Kützing, 1849
Stauroneis granii E. Jorgensen, 1905
Stephanopyxis palmeriana (Greville) Grunow, 1884
Stephanopyxis turris (Greville) Ralfs, 1861
Stoechospermum polypodioides (Lamouroux) Agardh, 1848
(Børgesen, 1934 as *Stoechospermum marginatum* (Agardh) Kützing)
Streblonema fasciculatum Thuret, 1863
Stypopodium shameelii Nizamuddin andAisha, 1996
Stypopodium zonale (Lamouroux) Papenfuss, 1940
Sundstroemia setigera (Brightwell) Medlin in Medlin *et al*., 2021
(Naz *et al.,* 2010 as *Rhizosolenia setigera)*
Surirella ovata Kützing. 1844
Synedra acus Kützing, 1844

Thalassionema frauenfeldii (Grunow) Tempère and Peragallo, 1910
Thalassionema nitzschioides (Grunow) Mereschkowsky, 1902
Thalassiosira eccentrica (Ehrenberg) Cleve, 1904
(Tabassum and Saifullah, 2013 as *Coscinodiscus excentricus* Ehrenberg)
Thalassiosira anguste-lineata (A.Schmidt) Fryxell and Hasle, 1977
Thalassiosira delicatula Ostenfeld, 1908
Thalassiosira gracilis (Karsten) Hustedt, 1958
Thalassiosira hyalina (Grunow) Gran, 1897
Thalassiosira leptopus (Grunowex Van Heurck) Hasle and G.Fryxell, 1977
Thalassiosira lineata Jousé, 1968
Thalassiosira mediterranea (Schröder)Hasle, 1972
Thalassiosira minima Gaarder, 1951
Thalassiosira oestrupii (Ostenfeld) Hasle, 1972
Thalassiosira pacifica Gran and Angst, 1931
Thalassiosira punctigera (Castracane) Hasle, 1983
Thalassiosira gravida Cleve, 1896
Thalassiothrix frauenfeldii var. ***javanica*** Grunow, 1881
(Hamid *et al.,* 2023 as *Thalassionemajavanicum*)
Thurammina papillata Brady, 1879
Tintinnopsis campanula (Ehrenberg, 1840)
Tintinnopsis parva Merkle, 1910
Tintinnopsis rotundata Kofoid & Campbell, 1929
Toxariumun dulatum Bailey, 1854
(Saifullah and Chaghtai, 1993 as *Synedra undulata* (J.W. Bailey) Gregory)
Trachyneis antillarum (Cleve & Grunow) Cleve, 1894
Triceracium sp.
Trieres mobiliensis (J.W. Bailey) Ashworth and Theriot, 2013
(Latif *et al.,* 2013 as *Biddulphia mobiliensis* (J.W. Bailey) Grunow, 1882)
Trieres regia (M. Schultze) Ashworth and Theriot, 2013
Trieres sinensis (Greville) Ashworth and Theriot, 2013
Tripos arietinus (Cleve) F. Gómez, 2013
Tripos azoricus (Cleve) F. Gómez, 2013
(Saleem *et al.,* 2014 as *Ceratium azoricum*)
Tripos belone (Cleve) F. Gómez, 2013
(Latif *et al.,* 2013 as *C. belone* Cleve)
Tripos brevis (Ostenf. and E.J. Schmidt) F. Gómez, 2021
Tripos candelabrus (Ehrenb) F. Gómez, 2013.
Tripos carriensis (Gourret) F. Gómez, 2013
Tripos contraries (Gourret) F. Gómez, 2013
Tripos declinatus (G. Karsten) F. Gómez, 2013
(Latif *et al.,* 2013 as *C. declineatum* Karsten)
Tripos deflexus (Kofoid) F. Gómez, 2013
(Latif *et al.,* 2013 as *Ceratium deflexum* (Kofoid) Jörgensen) T
Tripos dens (Ostenf. and E.J. Schmidt) F. Gómez, 2013

(Latif *et al.,* 2013 as *C. dens* Ostenfeld and Schmidt)
Tripos denticulatus (Jørg.1920)
Tripos egyptiacus (Halim) F. Gómez, 2013
Tripos extensus (Gourret) F. Gómez, 2013
(Latif *et al.,* 2013 as *C.extensum* (Gourret) Cleve)
Tripos falcatus (Kofoid) Gómez, 2013 as *C. falcatum* (Kofoid) Jorgensen
Tripos furca (Ehrenb) Gómez, 2013
Tripos fusus (Ehrenb) Gómez, 2013
Tripos geniculatus (Lemmerm) F.gómez, 2013
Tripos gibberus (Gourret, 1883)
Tripos horridus (Cleve) F. Gómez, 2013
Tripos humilis (Jörg.) Gómez, 2013
Tripos inflatus (Kof.) Gómez, 2013
Tripos kofoidii (Jörg.) Gómez, 2013
(Latif *et al.,* 2013 as *C. kofoidii* Jorgensen)
Tripos limulus (Pouchet) Gómez, 2013
Tripos lineatus (Ehrenb.) Gómez, 2013
Tripos longipes (Bailey) Gómez, 2103
Tripos longirostrum (Gourret) Hallegraeff and Huisman, 2020
(Hassan and Saifullah, 2009 as *C. longirostrum* Gourret)
Tripos lunula (Schimper ex Karsten) Gómez, 2013
(Latif *et al.,* 2013 as *C.lunula* Schimper ex Karsten)
Tripos macroceros (Ehrenb) F. Gómez, 2013
Tripos massiliensis (Gourret) F. Gómez, 2013 as *C. massiliense* var. *massiliense* Sournia
Tripos minutus (Jörg.) F.Gómez, 2013
Tripos muelleri Bory, 1825
Tripos muelleri subsp. ***vultur*** (Cleve, 1900)
Tripos muelleri f. ***parallelus*** (Schmidt) F. Gómez, 2013
Tripos pentagonus (Gourret) Gómez, 2013
Tripos pulchellus (Schröd.) Gómez, 2013
Tripos ranipes (Cleve) Gómez, 2013
Tripos reflexus (Cleve) Gómez, 2013
Tripos seta (Ehrenberg) Gómez, 2013
(Latif *et al*., 2013 as *C. fusus* var. *seta* (Ehrenberg) Sournia)
Tripos setaceus (Jørg) F. Gómez, 2013
Tripos symmetricus (Pavill) Gómez, 2013
Tripos teres (Kof, 1907) Gómez, 2013
Tripos trichoceros (Ehrenb) Gómez, 2013
(Latif *et al*., 2013 as *C. trichoceros* (Ehrenberg) Kofoid)
Stainforthia fusiformis (Williamson, 1858)
Uvigerina peregrina Cushman, 1923
Uvigerina exgr.U. semiornata d'Orbigny, 1846
Valvulineria araucana (d'Orbigny, 1839)
Valvulineria minuta (Schubert, 1904)
Vaucheria karachiensis Saifullah, Nizamuddin and Gul, 2003
Vaucheria longicaulis Hoppaugh, 1930
Veleroninoides scitulus (Brady, 1881)
(Schumacher *et al.,* 2007 as *Cribrostomoides scitulus* (Brady)
Verneuilinulla propinqua (Brady, 1884) (Schumacher *et al.,* 2007 as *Verneuilinapropinqua*)
Vibrio paxillifer Müller, 1786
(Hamid *et al.,* 2023 as *Bacillaria*

paxillifer (O.F. Müller) T. Marsson
Virgulinella fragilis Grindell & Collen, 1976
Warnowia polyphemus (C.H.G. Pouchet 1895)

Discussion

Many benefits are provided by the tiny planktonic and benthic marine protist and chromid diversity. Protista function at several levels of the ecological food web. They are important as decomposers, oxygen producers, and a source of food for manymarine animals and thus support a range of organisms and environments. Similarly the photo-autotrophic Chromista playa crucial role in creating a balanced aquatic ecosystem. Some phylainthese kingdoms also appear more valuable plant manure for watering of vegetables (Pennington, 1941).

Many of the species in these kingdoms, for example in phylum Foraminifera (meiofaunalprotists) are impossible to assign confidently to named taxa. A similar situation prevails elsewhere in the deep sea (Gooday *et al*., 2010), reflecting how much remains to be learnt about the diversity of these important groups.

Long-term biological and environmental time-series are essential for distinguishing between anthropogenically and naturally induced environmental change as well as for monitoring environmental change over time. Since such long time-series are virtually non-existent for most areas of the world, new methods have been explored which provide the best possible analogues. Numerous investigations have shown that benthic foraminifera, which leave a fossil record in most marine sediments, are well suited for this purpose.

The coastal waters of the megacity Karachi is continuously being threatened by the phenomenon of eutrophication. The effluent discharges from Karachi are causing deterioration of water quality. The Manora Channel is also highly affected by oil pollution because of its close location to the oil terminal, wharves and fish harbour. The area is also under the influence of monsoon system. These regional changes have great influence on chromist communities´ abundance which should be regularly monitored.

Conclusion

There isn't specific research or in formation available on biotic kingdoms as Protista and Chromista in Pakistan. As we know that species checklists are living entities, especially for biological invasions given the growing nature of the problem (Shabbir *et al.,*2020); a prerequisite for ecological studies, biodiversity assessment and monitoring, conservation reports, I hope this checklist will quicken the planning application process.

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References

Aisha, K. (2017). Flora of brown seaweed from Pakistan (Part-Ectocarpales). *Pakistan Journal of Marine Sciences*, 26(1-2), 15-49.

Aisha, K., & Shameel, M. (2010). Occurrence of the genus *Padina* (Dictyophyceae, Phaeophycota) in the coastal waters of Karachi. *Pakistan Journal of Botany*, 42 (Special Issue), 319-340.

Aisha, K., & Shameel, M. (2011). Taxonomic study of the order Ectocarpales (Phaeophycota) from the coastal waters of Pakistan. *International Journal on Algae*, 13(2), 128-148. https://doi.org/[insert DOI if available]

Aisha, K., Shameel, M., & Imran, M. (2010). Taxonomy of the genus *Spatoglossum* (Dictyophyceae, Phaeophycota) in the coastal waters of Karachi. *Pakistan Journal of Marine Sciences*, 19(1-2), 33-44.

Ali, S. T., Zarina, A., & Shameel, M. (2011). Distribution pattern of pennate diatoms in the north-eastern areas of Pakistan. *International Journal on Algae*, 14(3), 265-278.

Al-Kandari, M., Al-Yamani, F. Y., & Al-Rifaie, K. (2009). *Marine phytoplankton atlas of Kuwait's waters*. Kuwait Institute for Scientific Research.

Anand, P. L. (1940). *Marine algae from Karachi. Part I: Chlorophyceae* (Vol. 1, pp. 1-52). Panjab University Botanical Publications.

Aranda da Silva, A. A. S., Pawlowski, J., & Gooday, A. J. (2006). High diversity of deep-sea Gromia from the Arabian Sea revealed by small subunit rDNA sequence analysis. *Marine Biology*, 148(4), 769-777. https://doi.org/10.1007/s00227-005-0113-3

Arshad, N., & Farooq, S. (2022). Alive and dead foraminiferal assemblages at sandy beaches of Karachi coast–diversity, ecological distribution and responses to seasonal fluctuations. Regional Studies in Marine Science, 55, 102540. https://doi.org/10.1016/j.rsma. 2022.102540

Baig, H. S., Saifullah, S. M., & Dar, A. (2006). Occurrence and toxicity of Amphidinium carterae Hulburt in the North Arabian Sea. *Harmful Algae*, 5(2), 133-140. https://doi.org/10.1016/j.hal.2005.06.009

Begum, M., & Khatoon, N. (1988). Distribution of and some ecological notes of Phaeophyta from the coast of Karachi. *Pakistan Journal of Botany*, 20(2), 291.

Chaghtai, F., & Saifullah, S. M. (1988). An illustrated account of species of Ceratium Schrank found in North Arabian Sea bordering Pakistan. *Centre of Excellence in Marine Biology*, University of Karachi Publication, 5, 1-50.

Chaghtai, F., & Saifullah, S. M. (1992). First recorded bloom of Navicula Bory in a mangrove habitat of Karachi. *Pakistan Journal of Marine Science*, 1, 139-140.

Chaghtai, F., & Saifullah, S. M. (2001). Harmful Algal Bloom (HAB) organisms of the northern Arabian Sea bordering Pakistan-1 Gonyaulax Diesing. *Pakistan Journal of Botany*, 33(1), 69-75.

Chaghtai, F., & Saifullah, S. M. (2006). On the occurrence of green Noctiluca scintillans blooms in the coastal waters of Pakistan, northern Arabian Sea. *Pakistan Journal of Botany*, 38(3), 893-898.

Erbacher, J., & Nelskamp, S. (2006). Comparison of benthic foraminifera inside and outside a sulphur-oxidizing bacterial mat from the present oxygen-minimum zone of Pakistan (NE Arabian Sea). *Deep Sea Research Part I*: Oceanographic Research Papers, 53(5), 751-775.

Ghazala, B., Ormond, R., & Hanna, F. (2006). Phytoplankton communities of Pakistan. I. Dinophyta and Bacillariophyta from the coast of Sindh. *International Journal of Phycology and Phycochemistry*, 2, 183-196.

Gooday, A. J., & Bowser, S. S. (2005). The second species of Gromia (Protista) from the deep sea: Its natural history and association with the Pakistan Margin Oxygen Minimum Zone. *Protist*, 156(1), 113-126.

Gooday, A. J., Levin, L. A., Aranda da Silva, A., Bett, B. J., Cowie, G. L., Dissard, D., & Woulds, C. (2009). Faunal responses to oxygen gradients on the Pakistan margin: A comparison of foraminiferans, macrofauna and megafauna. *Deep Sea Research Part II*: Topical Studies in Oceanography, 56(6-7), 488-502.

Gopang, A., Farooq, S., & Ali, Q. M. (2023). First record of alive Asterigerina (Foraminifera: Rotaliida) with note on its distribution and abundance from the coastal area of Pakistan, northern Arabian Sea. *Pakistan Journal of Marine Science*, 32(2), 151-158.

Gul, S., & Nawaz, M. F. (2014). The Dinoflagellate genera Protoperidinium and Podolampas from Pakistan's shelf and deep Sea Vicinity (North Arabian Sea). *Turkish Journal of Fisheries and Aquatic Sciences*, 14(1), 91-100.

Gul, S., & Saifullah, S. M. (2010). Taxonomic and ecological studies on three marine genera of dinophysiales from Arabian Sea shelf of Pakistan. *Pakistan Journal of Botany*, 42(4), 2647-2660.

Gul, S., & Saifullah, S. M. (2011). The dinoflagellate genus Prorocentrum (Prorocentrales, Prorocentraceae) from the North Arabian Sea. *Pakistan Journal of Botany*, 43(6), 3061-3065.

Gul, S., & Saifullah, S. M. (2012). Marine planktonic dinoflagellates of the order Gonyaulacales Taylor from coastal waters of Sindh, Pakistan. *International Journal of Phycology and Phycochemistry*, 8(2), 163-170.

Hamid, T. N., Nisha, S., & Siddiqui, P. J. A. (2023). Abundance and diversity of diatom communities in Gadani (Baluchistan coast) and Sandspit (Sindh coast). *Pakistan Journal of Botany*, 55(4), 1579-1590.

Hamid, T. N., Shoaib, M., & Siddiqui, P. J. A. (2023). Seasonal variation of diatom biodiversity with relation to environmental factors in Northern Arabian Sea. *Indian Journal of Geo-Marine Sciences*, 52(2), 101-113.

Harrison, P. J., Khan, N., Yin, K., Saleem, M., Bano, N., Nisa, M., & Azam, F. (1997). Nutrient and phytoplankton dynamics in two mangrove tidal creeks of the Indus River delta, Pakistan. *Marine Ecology Progress Series*, 157, 13-19.

Hassan, D., & Saifullah, S. M. (1972). Genus Peridinium Ehrenberg, from inshore waters of Karachi. *Pakistan Journal of Botany*, 4(2), 157-172.

Hassan, D., & Saifullah, S. M. (1974). The genus Ceratium Schrank from coastal waters of Karachi part. I. The Sub-genera Amphiceratium and Biceratium. *Botanica Marina*, 17, 82-87.

Hermelin, J., Otto, R., & Graham, S. (1990). Factor loading matrix for benthic foraminifera of Northwest Indian Ocean surface sediments. In J. Hermelin & G. Shimmield (Eds.), Benthic foraminifera in Northwest Indian Ocean surface sediments.

Hughes, D. J., Lamont, P. A., Levin, L. A., & Gage, J. D. (2009). Macrofaunal communities and sediment structure across the Pakistan margin Oxygen Minimum Zone, North-East Arabian Sea. *Deep-Sea Research Part II*: Topical Studies in Oceanography, 56, 434-448.

Jannink, N. T., Zachariasse, W. J., & Van der Zwaan, G. J. (1998). Living (Rose Bengal stained) benthic foraminifera from the Pakistan continental margin (northern Arabian Sea). *Deep Sea Research Part I*: Oceanographic Research Papers, 45(9), 1483-1513.

Khan, S. H. (1986). Nontoxic bloom of Asterionella japonica on Clifton beach. *Pakistan Journal of Botany*, 18, 361-363.

Khokhar, F. N., Ahmed, N., Ali, A., Gabol, K., Khooharo, A. R., Faheem, M., & Siddiqui, P. J. A. (2021). Distribution and abundance of dinoflagellates from the coastal waters of Karachi, Pakistan, northern part of the Arabian Sea. *Brazilian Journal of Biology*, 82, e245124.

Khokhar, F. N., Burhan, Z., Iqbal, P., Abbasi, J., & Siddiqui, P. J. A. (2016). Distribution and abundance of diatom species from coastal waters of Karachi, Pakistan. *Pakistan Journal of Botany*, 48(20), 799-811.

Kuzmenko, V. (1975). Systematic composition of phytoplankton of Arabian Sea. Biologiya Morya, 34, 15-261.

Larkin, K. E. (2006). Community and trophic responses of benthic Foraminifera to oxygen gradients and organic enrichment (Doctoral thesis, University of Southampton).

Larkin, K. E., & Gooday, A. J. (2009). Foraminiferal faunal responses to monsoon-driven changes in organic matter and oxygen availability at 140 m and 300 m water depth in the NE Arabian Sea. *Deep Sea Research Part II*: Topical Studies in Oceanography, 56(6-7), 403-421.

Latif, S. Z., Ayub, S., & Siddiqui, G. (2013). Seasonal variability of phytoplankton in a coastal lagoon and adjacent open sea in Pakistan. *Turkish Journal of Botany*, 37(2), 398-410.

Levin, L. A., Whitcraft, C. R., Mendoza, G. F., & Gonzalez, J. P. (2009). Oxygen and organic matter thresholds for benthic faunal activity on the Pakistan margin oxygen minimum zone (700-1100 m). *Deep Sea Research Part II*: Topical Studies in Oceanography, 56(6), 449-471.

Luqman, M. (2019). Marine diatoms of Pakistan. Lap Lambert Academic Publishing.

Mansoor, S., & Saifullah, S. M. (1995). A new species and a new variety of Amphisolenia Stein from the North Arabian Sea bordering Pakistan. *Pakistan Journal of Marine Science*, 4(1),

5-8.

Mehrun Nisa., Shahid, A., Shaukat, H. K., & Saiyad, I. A. (1998). Abundance of Planktoneillasol in the northern Arabian Sea during the 1992 NE monsoon 17th-20th March 1998. 1st GLOBEC Open Science Meeting, UNESCO Headquarters, Paris, France.

Moazzam, M. (1973). Taxonomic and seasonal studies of planktonic centric diatoms from Manora channel (Lower Harbour) Karachi (*Master's thesis*, University of Karachi).

Munir, S., Naz, T., Burhan, Z. N., Siddiqui, P. J. A., & Morton, S. L. (2012). First report of the athecate, chain-forming dinoflagellate Cochlodinium fulvescens (Gymnodiniales) from Pakistan. *Pakistan Journal of Botany*, 44, 2129-2134.

Munir, S., Naz, T., Burhan, Z., Siddiqui, P. J. A., & Morton, S. L. (2012). Potentially harmful dinoflagellates (Dinophyceae) from the coast of Pakistan. Proceedings of the 14th *International Conference on Harmful Algae*.

Munir, S., Naz, T., Burhan, Z., Siddiqui, P. J. A., & Morton, S. L. (2016). Species composition and abundance of dinoflagellates from the coastal waters of Pakistan. *Journal of Coastal Life Medicine*, 4(6), 448-457.

Munir, S., Zaib-un-nisa, T. N., Burhan, Z., Morton, S. L., & Siddiqui, P. J. A. (2015). Morphometric forms, biovolume and cellular carbon content of dinoflagellates from polluted waters on the Karachi coast, Pakistan. *Indian Journal of Geo-Marine Sciences*, 44(1), 19-25.

Murty, S. J., Bett, B. J., & Gooday, A. J. (2009). Megafaunal responses to strong oxygen gradients on the Pakistan margin of the Arabian Sea. *Deep Sea Research Part II*: Topical Studies in Oceanography, 56(6-7), 472-487.

Naz, D. T. (2019). Diversity of Diatom (Bacillariophyta) Flora from the Coastal Waters of Pakistan: A Review on Ecology and Taxonomy. IJSBAR, 48(3), 224-243.

Naz, T., & Siddiqui, P. J. A. (2012). Taxonomy of potentially harmful diatom Coscinodiscus cf. wailesii Gran et Angst (Coscinodiscales, Bacillariophyta) from Pakistan waters. *Journal of Algae and Biomass Utilization*, 3, 28-31.

Naz, T., Burhan, Z., Munir, S., & Siddiqui, P. J. A. (2010). Diatom species composition and seasonal abundance in a polluted and non-polluted environment from the coast of Pakistan. *Asian Journal of Water, Environment and Pollution*, 7(4), 25-38.

Naz, T., Burhan, Z., Munir, S., & Siddiqui, P. J. A. (2012). A preliminary guide for the taxonomic identification of diatom (Bacillariophyta) species from the coast of Pakistan. *New York Science Journal*, 5(3), 70-80.

Naz, T., Burhan, Z., Munir, S., & Siddiqui, P. J. A. (2012). Taxonomy and seasonal distribution of Pseudo-nitzschia species (Bacillariophyceae) from the coastal waters of Pakistan. *Pakistan Journal of Botany*, 44(4), 1467-1473.

Nizamuddin, M., & Begum, M. (2006). Studies on the genus Padina Adanson 1763. *International Journal of Biology and Biotechnology*, 3, 215-236.

Nurruddin, M. (1967). An account of the phytoplankton of Karachi with a note on their seasonal variations and distribution. Agri Pakistan, 1, 1-18.

Pennington, W. (1941). Plankton as a source of food. *Nature*, 148, 314.

Rasheed, S., Bano, A., Rashid, M., & Latif, A. (2019). A study of occurrence of planktons from Balochistan Waters. *International Journal of Marine Science*, 9(5), 45-48.

Saifullah, S. M. (1979). Occurrence of dinoflagellates and distribution of chlorophyll a on Pakistan's shelf. In D. L. Taylor & H. H. Seliger (Eds.), Toxic Dinoflagellate Blooms (pp. 203-208). Elsevier/North Holland.

Saifullah, S. M., & Chaghtai, F. (1990). Incidence of Noctiluca scintillans (Macartney) Ehrenb. blooms along Pakistan shelf. *Pakistan Journal of Botany*, 22(2), 94-99.

Saifullah, S. M., & Chaghtai, F. (1993). Marine benthic diatoms in mangrove habitat of Sandspit, Karachi. In Q. B. Kazmi & N. M. Tirmizi (Eds.), National Seminar on Study and Management in Coastal Zones in Pakistan (pp. 239-247).

Saifullah, S. M., & Moazzam, M. (1977). Species composition and seasonal occurrence of centric diatoms in a polluted environment. *Pakistan Journal of Botany*, 10(1), 53-64.

Saleem, M., Aftab, J., Kahkashan, S., Kalhora, N. A., & Ahmad, W. (2014). Diurnal variation of nutrients, water quality and plankton composition in the Hajamro Creek (Indus Delta) during north east monsoon period. *The Nucleus*, 51(1), 51-61.

Schulz, H., von Rad, U., & Ittekkot, V. (2002). Planktic foraminifera, particle flux and oceanic productivity of Pakistan, NE Arabian Sea: Modern analogues and application to the palaeoclimatic record. In The Tectonic and Climate Evolution of the Arabian Sea Region (pp. 499-516). Geological Society of London.

Schumacher, S. (2017). Live benthic foraminifera of post-monsoon season samples from the Pakistan continental margin, large size fraction. PANGAEA Data Publisher for Earth and Environmental Science.

Schumacher, S., Jorissen, F. J., Dissard, D., Larkin, K. E., & Gooday, A. J. (2007). Live (Rose Bengal stained) and dead benthic foraminifera from the oxygen minimum zone of the Pakistan continental margin (Arabian Sea). *Marine Micropaleontology*, 62(1), 45-73.

Shabbir, A., Wong, L. J., & Pagad, S. (2020). Global Register of Introduced and Invasive Species - Pakistan. Invasive Species Specialist Group ISSG. Dataset/Checklist.

Shahnaz, L., Naz, S., Shehnaz, H., & Haider, A. (2018). Distribution and diversity of phytoplankton from the coastal waters of Manora, Karachi, Pakistan. *International Journal of Biology Research*, 6(1), 49-57.

Shaikh, W., & Shameel, M. (1995). Taxonomic study of brown algae commonly growing on the coast of Karachi, Pakistan. *Pakistan Journal of Marine Science*, 4(1), 9-38.

Shoaib, M., Burhan, Z., Shafique, S., Jabeen, H., & Siddique, P. J. A. (2017). Phytoplankton composition in a mangrove ecosystem at Sandspit, Karachi, Pakistan. *Pakistan Journal of Botany*, 49(1), 379-387.

Tabassum, A., & Saifullah, S. M. (2010). The planktonic diatom of the genus Chaetoceros Ehrenberg from northwestern Arabian Sea bordering Pakistan. *Pakistan Journal of Botany*, 42(2), 1137-1151.

Tabassum, A., & Saifullah, S. M. (2011). Marine centric diatom Rhizosolenia Brightwell: Its

occurrence and distribution in neritic waters of Pakistan. *Pakistan Journal of Botany*, 43(4), 2187-2193.

Tabassum, A., & Saifullah, S. M. (2012). Centric diatom genera Guinardia H. Peragallo and Dactyliosolen Castacane from the North Arabian Sea bordering Pakistan. *International Journal of Phycology and Phycochemistry*, 8(2), 171-176.

Tabassum, A., Baig, H. S., Shaukat, S. S., & Rehman, A. (2017). Species composition analysis of marine centric diatoms after Tasman spirit oil spill. *International Journal of Biology and Biotechnology*, 14(3), 371-378.