Nomenclatural notes on algae. I. Replacement names for various algal taxa

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While compiling a phycological database for environmental purposes, one of us (EAM-N) found that some names in current use for extant and fossil algae are later homonyms and thus illegitimate under Art. 53.1 of the Shenzhen Code (ICN, Turland & al., 2018). We then embarked upon a thorough study of the taxonomical and nomenclatural standing of these problematic names. We tried to follow faithfully the framework established by Blanco & Wetzel (2016), discarding the cases of: a) later homonyms of invalid names with no nomenclatural standing; b) later homonyms of orthographic variants; c) later homonyms of doubtfully botanical genera (particularly in relation to fossil taxa), d) later homonyms currently considered synonyms of valid names; and e) names that cannot be found in relatively new literature (mid-20th century and onwards). We have added notes under the new names to give some insight on their nomenclature or taxonomy.

During our bibliographical research, we found it difficult to locate some sources because databases often use abbreviations instead of full names for authors and places of publication, and some non-Western names were poorly translated or transliterated. To help future researchers, we provide full references for both the replaced names and their homonyms, so this publication may facilitate the updating of nomenclatural databases and serve as a bibliographic source.

Aureoarbor Molinari & Sánchez Ocharan, *nom. nov*.
Replaced name: *Chrysodendron* Pascher, *Archiv für Protistenkunde* 57: 320, 1927 (*Ochrophyta*, *Ochromonadaceae*), *non Chrysodendron* Mier y Terán & Berlandier (1832: 7), *Berberidaceae*.
Type: *Chrysodendron ramosum* Pascher (monotypic genus at the time of publication).
Notes: While *Chrysodendron* Mier y Terán & Berlandier is a suppressed name included in the Appendix V of the ICN, and a synonym of *Berberis* L. (Marroquín, 1993), later homonyms are still illegitimate unless conserved, according to Art. 53.1, note 2. *Aureoarbor ramosa* forms sessile colonies of cells joined by stalks (Chapman & Chapman, 1973). Originally described from samples taken in Austria and Czech Republic, it has been recently reported from Lake Uvildy in the southern Urals, Chelyabinsk Oblast, Russia (Mavrina, 2016). The algal genus is renamed using a portmanteau of *aura arbor*, a Latin translation of the original Greek name, with same meaning of "golden tree".
Species: ***Aureoarbor ramosa*** (Pascher) Molinari & Sánchez Ocharan, *comb. nov*. Basionym: *Chrysodendron ramosum* Pascher, *Archiv für Protistenkunde* 57: 320, 1927.

Austroepiphloea Molinari, Sánchez Ocharan & Guiry, *nom. nov.*
Replaced name: *Epiphloea* J.Agardh, *Kungliga Fysiografiska Sällskapet handlingar* 26(3): 18, 1890 (*Rhodophyta*, *Halymeniaceae*), *non Epiphloea* Trevisan (1880: 73), *Collemataceae*.
Type: *Schizymenia bullosa* Harvey (designated by Schmitz (1894: 634)).
Notes: *Austroepiphloea* is a genus only known to occur in southern Australia (Guiry & Guiry, 2021). J.Agardh (1890) erected the genus with two species: *Epiphloea harveyi*, a superfluous replacement name for *Schizymenia bullosa* Harvey, and *E. grandifolia* J.Agardh, currently

Pachymenia orbicularis (Zanardini) Setchell & N.L.Gardner. The correct combination for the lectotype species was made by De Toni (1905: 1578).
Species: ***Austroepiphloea bullosa*** (Harvey) Molinari, Sánchez Ocharan & Guiry, *comb. nov.* Basionym: *Schizymenia bullosa* Harvey, *Phycologia australica* 5: xlvii, pl. CCLXXVII, 1863.

Borziella Molinari & Guiry, *nom. nov*.
Replaced name: *Bacularia* Borzì, *Nuova Notarisia* 16: 21, 1905 (*Cyanobacteria*, *Synechococcaceae*)*, non Bacularia* Mueller (1878: 58), *Arecaceae*.
Type: *Bacularia coerulescens* Borzì (monotypic genus at the time of publication).
Notes: We follow Komárek & Johansen (2015), who included five species. *Borziella* species can be found in meta- and periphytic habitats from freshwater sources world-wide, forming filamentous or tubular colonies (Komárek & Johansen, 2015). *Rhabdoderma vermiculare* Fedorov is a later homonym of *R. vermiculare* Fott (1952: 192), so the proposed combination by Komárek & Anagnostidis (1995: 17) is a replacement name to be credited only to the later authors. The genus is renamed after Antonino Borzì (1852-1921), its original author.
Species: ***Borziella coerulescens*** (Borzì) Molinari & Guiry, *comb. nov.* Basionym: *Bacularia coerulescens* Borzì, *Nuova Notarisia* 16: 21, 1905. ***Borziella gracilis*** (Komárek) Molinari & Guiry, *comb. nov*. Basionym: *Bacularia gracilis* Komárek, *Folia Geobotanica et Phytotaxonomica* 30: 86, 1995. ***Borziella indurata*** (J.J.Copeland) Molinari & Guiry, *comb. nov.* Basionym: *Bacillosiphon induratus* J.J.Copeland, *Annals of the New York Academy of Sciences* 36: 66, 1936. ***Borziella thermalis*** (Frémy) Molinari & Guiry, *comb. nov.* Basionym: *Bacularia thermalis* Frémy, *Exploration du Parc National Albert Park, Mission H. Dumas* 19: 39, 1949. ***Borziella vermicularis*** Molinari & Guiry, *nom. nov.* Basionym: *Rhabdoderma vermiculare* Fedorov, *Novosti sistematiki nizshikh rastenii* 6: 15, 1969.

Caeruleovitis Molinari & Sánchez Ocharan, *nom. nov.*
Replaced name: *Cyanobotrys* L.Hoffmann, *Archiv für Hydrobiologie, Supplementbände (Algological Studies)* 92: 349, 1991 (*Cyanobacteria*, *Stigonemataceae*)*, non Cyanobotrys* Zuccarini (1845: 28), *Fabaceae*.
Type: *Cyanobotrys lambinonii* L.Hoffmann (monotypic genus at the time of publication).
Notes: Komárek & al. (2014) included this genus in their polyphasic classification, pointing out that the *Stigonemataceae* required further molecular assessment. The genus is renamed using a portmanteau of *caerulea* and *vitis*, meaning "blue grape", the Latin translation of the original Greek name.
Species: ***Caeruleovitis lambinonii*** (L.Hoffmann) Molinari & Sánchez Ocharan, *comb. nov.* Basionym: *Cyanobotrys lambinonii* L.Hoffmann *Archiv für Hydrobiologie, Supplementbände (Algological Studies)* 92: 350, 1991.

Circularius Molinari, Sánchez Ocharan & Guiry, *nom. nov.*
Replaced name: *Annularius* S.Komura *Diatom* 21: 31, 2005 (*Ochrophyta*, *Bacillariophyceae incertae sedis*)*, non Annularius* Roussel (1806: 61), *Agaricaceae*.
Type: *Annularius foveatus* S.Komura (monotypic genus at the time of publication).
Notes: The type material was obtained from Miocenic marine sediments of the Miura peninsula, in Tokyo bay. The genus is renamed replacing "*annulus*" with "*circulus*", both meaning "ring".
Species: ***Circularius foveatus*** (S.Komura) Molinari, Sánchez Ocharan & Guiry, *comb. nov.* Basionym: *Annularius foveatus* S.Komura, *Diatom* 21: 31, 2005.

Favulina Molinari & Guiry, *nom. nov.*
Replaced name: *Apinella* Granier, Michaud & Fourcade, *Geobios* 19: 804, 1986 (*Chlorophyta*, *Triploporellaceae*), *non Apinella* Rafinesque (1840: 52), *Apiaceae*.

Type: *Apinella jaffrezoi* Granier, Michaud & Fourcade (effectively a monotypic genus at the time of publication).

Notes**:** This genus of Jurassic and Cretaceous algae was created with three intended species, but the authors failed to transfer effectively two of them from the fossil genus *Salpingoporella*. The new name, meaning "little honeycomb", was chosen as the original authors tried to evoke a "*nid d'abeille*" in their name. For its taxonomy, we follow Granier & Jaillard (2018).

Species: ***Favulina hispanica*** (Conrad & Grabner) Molinari & Guiry, *comb. nov.* Basionym: *Salpingoporella hispanica* Conrad & Grabner, *Compte rendu des séances de la Société de physique et d'histoire naturelle de Genève* 9: 33, 1974. ***Favulina jaffrezoi*** (Granier, Michaud & Fourcade) Molinari & Guiry, *comb. nov.* Basionym: *Apinella jaffrezoi* Granier, Michaud & Fourcade, *Geobios* 19: 804, 1986. ***Favulina urladanasii*** (Conrad, Peybernés & Radoičić) Molinari & Guiry, *comb. nov.* Basionym: *Salpingoporella urladanasii* Conrad, Peybernés & Radoičić, *Géologie Méditerranéenne* 4: 76, 1977 (as "*urladanasi*").

Gangriphycus Molinari, Mayta, Sánchez Ocharan & Guiry, *nom. nov.*

Replaced name: *Embergerella* Güvenç, *Türkiye Jeoloji Kurumu Bülteni* 15: 21, 1972 (*Chlorophyta*, *Seletonellaceae*)*, non Embergerella* Grambast (1969: 880), (*Clavatoraceae*).

Type: *Embergerella anatoliana* Güvenç (monotypic genus at the time of publication).

Notes: Güvenç & al. (1995) proposed a new name for the genus, but did not cite the original place of publication, rendering their name invalid. Species of *Gangriphycus* have been found in Permian deposits from Turkey, Spain (Cózar & Vachard, 2004) and France (Vachard & al., 2016). The genus is renamed after the classic name of its type location, Gangra, later known as Germanicopolis by the Romans, and currently known as Çankırı, a name derived from the original Greek (Giftopoulou, 2003).

Species: ***Gangriphycus anatolianus*** (Güvenç) Molinari, Mayta, Sánchez Ocharan & Guiry, *comb. nov.* Basionym: *Embergerella anatoliana* Güvenç *Türkiye Jeoloji Kurumu Bülteni* 15: 22, 1972.

Kufferathiella Molinari, Mayta & Guiry, *nom. nov.*

Replaced name: *Conradia* Kufferath, *Annales de Biologie Lacustre* 7: 244, 1914 (*Chlorophyta*, *Oocystaceae*)*, non Conradia* Rafinesque (1825: 3), *Liliaceae*, *nec Conradia* Martius (1829: 38), *Gesneriaceae*, *nec Conradia* Nuttall (1834: 88), *Scrophulariaceae*.

Type: *Conradia incrustans* Kufferath (monotypic at the time of publication).

Notes: This small alga has been variously referred as a close relative or possible member of other genera within the *Trebouxiophyceae* (Printz, 1927; Bourrelly, 1966); it is known only from the original description based on a sample taken in the Hageland, Belgium. The genus is renamed honouring its original author, Hubert Kufferath (1882-1957).

Species: ***Kufferathiella incrustans*** (Kufferath) Molinari, Mayta & Guiry, *comb. nov.* Basionym: *Conradia incrustans* Kufferath, *Annales de Biologie Lacustre* 7: 244, 1914.

Naisa Molinari, *nom. nov.*

Replaced name: *Cryptella* Pascher, *Jahrbücher für wissenschaftliche Botanik* 71: 459, 1929 (*Cryptophyta*, *Cryptomonadaceae*), *non Cryptella* Quélet (1875: 526), *Stictidaceae*.

Type: *Cryptella cyanophora* Pascher (monotypic genus at the time of publication).

Notes: The second species of the genus, *Cryptella angustata* Czosnowski (1948: 9) is a synonym of *Katablepharis ovalis* Skuja (Vørs, 1992). *Naisa cyanophora* has been recently rediscovered in the Czech Republic by Javornický (2016). It is renamed for Mariana "Naisa" Sosa (Faculty of Social Sciences, Pontifical Catholic University of Peru), whose unwavering academic and personal kindnesses during the 2018-2020 period allowed the author to overcome many hardships at that time.

Species: ***Naisa cyanophora*** (Pascher) Molinari, *comb. nov.* Basionym: *Cryptella cyanophora* Pascher, *Jahrbücher für wissenschaftliche Botanik* 71: 459, 1929.

Neocyanospira Molinari & Guiry, *nom. nov.*
Replaced name: *Cyanospira* Florenzano, Sili, Pelosi & Vincenzini (in Juráň & al.), *Taxon* 64: 845, 2015 (*Cyanobacteria*, *Aphanizomenonaceae*), *non Cyanospira* Chodat (1921: 298), *Euglenaceae*.
Type: *Cyanospira capsulata* Florenzano, Sili, Pelosi & Vincenzini.
Notes: Originally introduced by Florenzano & al. (1985), it was validated in the proposal for its conservation (Juráň & al. 2015), which was not recommended twice (Prud'homme van Reine 2017, Andersen 2018). We use the suggested name for this genus given in the latter report, so it may be valid and available for use under both the *ICN* and the *International Code of Nomenclature for Prokaryotes* (*ICNP*).
Species: ***Neocyanospira capsulata*** (Florenzano, Sili, Pelosi & Vincenzini) Molinari & Guiry, *comb. nov.* Basionym: *Cyanospira capsulata* Florenzano, Sili, Pelosi & Vincenzini (in Juráň & al.), *Taxon* 64: 845, 2015. ***Neocyanospira globosa*** (Hirano) Molinari & Guiry, *comb. nov.* Basionym: *Anabaena globosa* Hirano, *Contributions from the Biological Laboratory, Kyoto University* 16: 4, 1963.

Palaeofistula Molinari, Mayta & Guiry, *nom. nov.*
Replaced name: *Fistularia* Yakschin (in Yakschin & Luchununa), *Precambrian and Cambrian boundary deposits of the Siberian Platform (biostratigraphy, paleontology, conditions of formation)*: 33, 1981 (*Cyanobacteria*, *Oscillatoriaceae*), *non Fistularia* Stackhouse (1816: xi), *Fucaceae*, *nec Fistularia* Greville (1824: 300), *Ulvaceae*, *nec Fistularia* Kuntze (1891: 460), *Scrophulariaceae*.
Type: *Fistularia volubilis* Yakschin (as '*volubila*').
Notes: *Palaeofistula* represents a Precambrian blue-green alga, found in the Siberian highlands. It is renamed to emphasise its antiquity. Another species along with over twenty new taxa were invalidly published by Yakschin (2002) and are not included in the present work pending further investigations.
Species: ***Palaeofistula volubilis*** (Yakschin) Molinari & Mayta, *comb. nov.* Basionym: *Fistularia volubilis* Yakschin in Yakschin & Luchununa, *Precambrian and Cambrian boundary deposits of the Siberian Platform (biostratigraphy, paleontology, conditions of formation)*: 34, 1981.

Saxicolea Molinari & Sánchez Ocharan, *nom. nov.*
Replaced name: *Epilithia* Ercegović, *Rad Jugoslovenske Akademije Znanosti i Umjetnosti* 244: 142, 1932 (*Cyanobacteria*, *Xenococcaceae*), *non Epilithia* Nylander (1853: 165), *Gomphillaceae*.
Type: *Epilithia adriatica* Ercegović (a monotypic genus at the time of publication).
Notes: *Saxicolea* is a colonial blue-green alga inhabiting supratidal zones of the Dalmatic coast, on calcareous substrata. A full description, provided by Prof. Jiři Komárek in 2011, is available at AlgaeBase (Guiry & Guiry, 2021) . The name was coined by freely translating the original name as "rock inhabitant".
Species: ***Saxicolea adriatica*** (Ercegović) Molinari & Sánchez Ocharan, *comb. nov.* Basionym: *Epilithia adriatica* Ercegović, *Rad Jugoslovenske Akademije Znanosti i Umjetnosti* 244: 143, 1932.

Schirschovaea Molinari & Guiry, *nom. nov.*
Replaced name: *Circella* Schirschova, *Paleontologicheskij zhurnal* 4: 99, 1985 (*Chlorophyta*, *Codiaceae*), *non Circella* A.A. Luber ex Malyavkina (1953: 132), Fossil: *Sporae disperase*.
Type: *Circella duplicata* Schirschova (a monotypic genus at the time of publication).

Notes: The species represents a Devonian member of the *Codiaceae*, formerly included in the *Praecodiaceae* (Dragastan, 2008). We follow the taxonomy of Vachard (2020). The genus is renamed after the original author, Darya Schirschova.
Species: ***Schirschovaea duplicata*** (Schirschova) Molinari & Guiry, *comb. nov.* Basionym: *Circella duplicata* Schirschova, *Paleontologicheskij zhurnal* 4: 101, 1985.

Vitinella Molinari & Sánchez Ocharan, *nom. nov.*
Replaced name: *Botryella* Shuysky, *Fossil Calcareous Algae. Morphology, taxonomy, methods of study*: 99, 1987 (*Chlorophyta*, *Codiaceae*), *non Botryella* Sydow & P.Sydow (1916: 95), *Phaeosphaeriaceae*.
Type: *Botryella spinosa* Shuysky & Schirschova (a monotypic genus at the time of publication).
Notes: See the notes for *Schirschovaea*. The new name, meaning "little grape", is a free translation of the original Greek name.
Species: ***Vitinella spinosa*** (Shuysky & Schirschova) Molinari & Sánchez Ocharan, *comb. nov.* Basionym: *Botryella spinosa* Shuysky & Schirschova in Shuysky, *Fossil Calcareous Algae. Morphology, taxonomy, methods of study*: 99, 1987.

Vitivisus Molinari & Sánchez Ocharan, *nom. nov.*
Replaced name: *Botrys* Schirschova, *Paleontologicheskij zhurnal* 4: 101, 1985 (*Chlorophyta*, *Codiaceae*), *non Botrys* C.Bauhin ex Fourreau (1869: 138), *Lamiaceae*, *nec Botrys* Nieuwland (1914: 274), *Chenopodiaceae*.
Type: *Botrys compacta* Schirschova (monotypic genus at the time of publication).
Notes: See the notes for *Schirschovaea*. The new name, meaning "grape-resembling", is a free translation of the original Greek name.
Species: ***Vitivisus compactus*** (Schirschova) Molinari & Sánchez Ocharan, *comb. nov.* Basionym: *Botrys compacta* Schirschova, *Paleontologicheskij zhurnal* 4: 102, 1985.

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