Aegagropila brownii (Dillwyn) Kützing is the correct name for *Aegagropila linnaei* Kützing, the type of *Aegagropila* Kützing (*Pithophoraceae, Chlorophyta*), widely known as "Marimo" or "Cladophora Balls"

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Despite the widespread recent use of *Aegagropila linnaei* Kützing as the correct name for the type of *Aegagropila* Kützing (Kützing 1843), taking into account the currently accepted synonymy, the correct name for this species is *Aegagropila brownii* (Dillwyn) Kützing (Kützing 1854). It is typified by material collected from the Inishowen Peninsula (Co. Donegal) in NE Ireland by Robert Brown (1773–1858). This species is widely known as a ball-forming green alga ("Marimo", or "Cladophora Balls") that adapts well to freshwater aquaria and is widely available commercially.

The genus name *Aegagropila* Kützing was introduced in *Phycologia generalis* (Kützing 1843: 272) for a single species, *Aegagropila linnaei* Kützing, citing in synonymy *Conferva aegagropila* Linnaeus. Kützing, to avoid tautonymy, introduced a new name, what is now referred to as a replacement name or *nomen novum*. Such names remain typified by the type of the replaced name.

The replaced synonym, *Conferva aegagropila* Linnaeus (1753: 1167) was described initially by Linnaeus (1745: 371, no. 1027) as "*Conferva globosa, filamentis articulatis ramosissimus e centro prodentuntibus rectis*", an invalid pre-Linnaean polynomial. A lectotype for *Conferva aegagropila* was designated by Hoek (1963: 51) as **LINN** 1277.49 (cf. Spencer & al. 2009: 241), which is also the type of *Aegagropila linnaei* Kützing. The unlocalised type sheet in **LINN** (Fig. 1) is marked "*globosa*" and "*21*" [the published number, Linnaeus (1753: 1167-8)] and "*aegagropila*". The locality specified by Linnaeus (1745: 371, "*in Lacu Dannemorensi, ubi ad litora copisoe rejecitur*"; is Dannemorasjön, Östhammar Municipality, Uppsala County, Sweden, where the species was said to have been cast up in quantity on the shores.

Conferva brownii Dillwyn was described from material sent by Robert Brown from "Dunrea, Ireland" (Dillwyn 1809), where it was described as growing on "wet rocks in a cave". Although Brown provided a description in Latin, Dillwyn provided his own description but also quoted Brown's. Dillwyn went on to observe that "The ramifications and joints are so nearly similar to those of C[onferva] *aegagropila* that I apprehend that is can only be distinguished from that species by its very different mode of growth.".

Robert Brown studied medicine at Edinburgh University from 1790, but discontinued his studies in 1793, and enlisted in the Fife[shire] Fencibles*, a regiment that served in Ireland from 1797–1801 and was appointed a surgeon's mate in June 1795. He was posted to Fort Dunree (*An Dún Riabhach*, Irish, streaked, striped fortress; also known as Dunrea) on the Inishowen Peninsula, in Co. Donegal (Mabberley 1985: 46 *et seq.*). Mabberley (2022: 15) writes "Between his apparently rather leisurely duties [in Ireland], he botanised and corresponded with Withering. … He trained

* The Fencibles (from "defensible") was raised in parts of Scotland as a form of home guard to allow the regular British army to fight overseas. Most were disbanded at the end of the 18th century, but not before they played a crucial role in the Rebellion of 1798 in Ireland. The Fencibles was disbanded in 1802 in Kilkenny, Ireland.

himself in microscopy as well as continuing botanical fieldwork…". This was the British botanist William Withering (1741–1799), author of a popular early British flora, *The botanical arrangement of all the vegetables naturally growing in Great Britain,* that appeared in many editions from 1776 to 1792.

Lewis Weston Dillwyn (1778 –1855) was a British porcelain manufacturer, naturalist (algae and molluscs), and Member of Parliament. Specimens of his are found in several herbaria, but the main source of material for his seminal work *British Confervae* (1802–1809) is to be found in the National Museum Wales (**NMW**) as a bound volume of specimens "… labelled '*Herb. Brit. Confervae*', containing a total of 277 specimens of confervoid algae, arranged in the sequence of the synopsis of the '*British Confervae*'. Many of the specimens are original material used by Dillwyn in the preparation of the '*British Confervae*'…". However, a search of this volume and other Dillwyn material at NMW by Katherine Slade revealed only a single specimen of *C. brownii* in *Herb. Brit. Confervae* (No. 80, **NMW** 38.560.078) from Penzance, seemingly collected by John Ralfs (1807–1890) and thus cannot be type material of the species.

However, van den Hoek (1963: 51) specified that there was "…a fragment of the type in herb. Agardh (LD) no. 8527, from Ireland, leg. Brown, comm. Borrer.". Even though this is not explicitly stated, this constitutes a lectotypification of the species (ICN Art. 7.11, Turland & al. 2018). A search by one of us (PF) uncovered the sheet in **LD** (formerly a folder, Herb. Agardh 8527) annotated by van den Hoek as "Cladophora aegagropila (L.) Kütz.", with a specimen in a small, pinned envelope, stamped with 8527 and marked "*Conf. Brownii* Dillw./ Ireland/ R. Brown" written by Borrer & "*misit* Borrer/Ag. p. 105" written by C. A. Agardh, together with another modern envelope where Hoek had made a preparation from the main specimen during a two-week visit to Lund in 1961. This is clearly the "fragment of the type" referred to by van den Hoek (1963: 51). However, it does not give the specific locality in Ireland, but it is clear that it represents R. Brown material from there sent by Dillwyn to William J. Borrer (1781–1862), who later forwarded the specimen (or part of it) to C.A. Agardh (1785–1859). A search of the herbarium of the Natural History Museum (**BM**), which holds the algal material from Kew (**K**), revealed no Brown or Borrer material of *Conferva brownii*.

Conferva brownii was included in *Systema algarum* (Agardh 1824: 105), but is marked with a cross which, according to the preface, signifies that no material was available to C. Agardh then "*Quae species in collectione nostra desunt, signo* [cross] *notavimus"*. Borrer must thus have sent the specimen at a later date, and the two preserved letters from W. Borrer to C. Agardh in the Lund University library are dated 1826 and 1827, so presumably the specimen was sent then. Both letters indicate that algae were sent along with the letters, but there is no explicit statement that *C. brownii* was included. The first letter was sent with a package through John Lindley (1799–1865) and mentions that species Agardh lacked were targeted "I send a little packet for Agardh, which I hope will prove acceptable. It consists chiefly of species marked in his *Systema* as desiderata, &, scraps [?] as some of them, a few could not, perhaps, be easily procured by him elsewhere. I have divided for him a specimen from Dillwyn himself of the *Conf. comoides*…" and "Mr. Borrer offers for Professor Agardh's acceptance a few authenticated specimens, (most of them, he regrets to say, mere morsels,) of British Algae. Henfield, Sussex Sept. 11. 1826."

Parallel cases to this can be seen, for example, in *Conferva carnea* Dillwyn and *Conferva lanosa* Roth which are also marked with a cross in *Systema algarum* (1824: 103, 112), but for which there are several specimens in the Agardh herbarium, a few of which C. Agardh has annotated. For example, one of those (**LD**, Herb. Agardh 12535) is marked "*Conf. carnea Dillw. / ab ipso*" written

by Borrer & *"misit Borrer. / 66 C. Carnea Ag. p. 103.*" written by C. Agardh but apparently not available to C. Agardh until after 1824.

Dixon (1966) speculated on the origin of the Dillwyn material in the Agardh herbarium. It seems clear from the content and annotations of the specimens in the Agardh herbarium as well as the correspondence that the material came either from Dillwyn himself or was mostly sent via Borrer. The Agardh herbarium at **LD** has around 130 specimens originating from Dillwyn's herbarium. With regard to correspondence, there is only one letter from Dillwyn to C. Agardh at Lund University library dated 31 October 1815 in which he writes that he wanted to send duplicates of his algae to Agardh but was unsure if he could. It is not known to us if any material was sent then or if it was sent later. *"*...I am very happy to find that my work on the *British Confervae* has gained the honor of your approval & I regret that since it was published I have been obliged by a weakness in my Eyes to desist from using a Microscope so that I have nothing new on the subject to communicate & all I can do is to send you the Duplicates from my collection which may perhaps enable you the better to understand some of my species. I reside in Wales where we have not any direct communication with Sweden so that I am at a loss how to forward a Parcel but if you will tell me of any Person in London with whom one for you may be left I will immediately send it to him".

In the Agardh herbarium there is also another letter from Dillwyn together with another specimen of *C. brownii* (Hb. Ag. 8525) that he sent along with other algae. The letter is undated but was sent from Sketty Hall, which Dillwyn purchased in 1831, so it should be of later date than that. It reads

> "My dear Sir
> I have broken the seal of this Parcel just as it was on the point of being forwarded to add a *Conferva* which has been sent to me from a wet Cave in Cornwall & it appears to me to be *C. Brownii*. This is a species which I never gathered & for a knowledge of which I relied chiefly on the well known Accuracy of my Friend Rob. Brown. In great haste
> Yours very truly LW Dillwyn"

If the synonymy of *Conferva brownii* Dillwyn with *Conferva aegagropila* Linnaeus is accepted as is clearly the case (e.g. van den Hoek, 1963: 51; Škaloud & al. 2018: 181), the correct name for *Aegagropila linnaei* Kützing is *Aegagropila brownii* (Dillwyn) Kützing. On the other hand, if *Conferva brownii* Dillwyn is found not to be taxonomically identical to *Conferva aegagropila* Linnaeus, then the correct name is *Aegagropila linnaei* Kützing, 1843.

Aegagropila brownii (Dillwyn) Kützing, *Tabulae phycologicae*, Vol. IV, 1854: 13.
≡ *Conferva brownii* Dillwyn, *British Confervae*, 1809: 58 & suppl. pl. D [shown here as Fig. 2] .
= *Conferva aegagropila* Linnaeus, *Species plantarum*, 1753: 1167.
= *Aegagropila linnaei* Kützing, *Phycologia generalis*, 1843: 272.
Further synonyms: A more extensive list of homotypic and heterotypic synonyms is available at AlgaeBase with sources of synonymy.
LT: *Conf. Brownii* Dillw. Ireland. R. Brown. *misit* Borrer Ag. p. 105. (Herb. Agardh 8527, LD! Designated by van den Hoek 1963: 51)
Distribution: Mostly Holarctic, "… in freshwater lakes spans [sic] most of Europe, and it becomes rarer in the west and the south-east…also widespread in the brackish waters along the coast of the central and northern Baltic Sea at salinities of 6 psu and below… [also in] other brackish locations, especially in Britain and Ireland… from the Black and Caspian seas. … it has been reported from one saline inland location in Germany [Salziger See (Mansfelder Seen), near Halle]." (Boedeker & al. 2010a: 1495). The species has a disjunct distribution being commonly

recorded in Japan but more rarely in Siberia. Further details in Boedeker & al. (2010a, 2010b) and Škaloud & al. (2018: 182).

Conservation status: considered endangered and appears to be in decline in Europe and Japan (Boedeker & al. 2010b).

Common names: “marimo” (Japanese,マリモ or 毬藻) or “moss balls” (aquarium trade), “lake ball(s)”, “Cladophora balls” (Acton 1916).

Notes: Used widely and sold for hobby aquaria; many of aquarium strains originate (or originated) in the Ukraine, even in Japan where collection is prohibited (Boedeker & al. 2010b). A “Marimo Festival” (*Marimo Matsuri* まりも祭) is held annually at main hot-springs district of Lake Akan in Hokkaido, Japan since 1950 (Irimoto 2004), generally in October, with the aim of protecting the species, which in Lake Akan may form balls 20-30 cm in diameter. Lake Akan is a volcanic lake that formed some 6,000 years ago.

While the name *Aegagropila linnaei* Kützing has been in use in commerce, it has only been used since 2010, and as such is not a well-established name, and so does not merit conservation or protection (Art. 14, ICN, Turland & al. 2018).

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Acton, E. (1916). On the structure and origin of *Cladophora-balls*. *New Phytologist*15(1/2): 1–10, 5 figs.

Agardh, C.A. (1824). *Systema algarum* 1–312. Lundae [Lund]: Literis Berlingianis.

Boedeker, C., Eggert, A., Immers, A. & Wakana, I. (2010a). Biogeography of *Aegagropila linnaei* (Cladophorophyceae, Chlorophyta): a widespread freshwater alga with low effective dispersal potential shows a glacial imprint in its distribution. *Journal of Biogeography* 37: 1491–1503.

Boedeker, C., Eggert, A., Immers, A. & Smets, E. (2010b). Global decline of and threats to *Aegagropila linnaei*, with special reference to the lake ball habit. *BioScience Biotechnology and Biochemistry* 60: 187–198.

Dillwyn, L.W. (1809). *British Confervae*; or colored figures and descriptions of the British plants referred by botanists to the genus *Conferva*. pp. 1–87, 1–6 (Index and Errata), pls. 69, 100–109, A-G (with text). London: W. Phillips.

Dixon, P.S. (1966). Notes on important algal herbaria, IV. The herbarium of Lewis Weston Dillwyn (1778-1885). *British Phycological Bulletin* 3: 19–22.

Hoek, C. van den (1963). *Revision of the European species of* Cladophora. pp. [i] –vii, [1] –248, 1 fig., 55 pls, 18 maps. Leiden: E.J. Brill.

Irimoto, T. (2004). Creation of the marimo festival: Ainu identity and ethnic symbiosis. *Senri Ethnological Studies* 66: 11–38.

Kützing, F.T. (1843). *Phycologia generalis* oder Anatomie, Physiologie und Systemkunde der Tange. Mit 80 farbig gedruckten Tafeln, gezeichnet und gravirt vom Verfasser. pp. [part 1]: [i] –xxxii, [1] –142, [part 2:] 143–458, 1, err.], pls 1–80. Leipzig: F.A. Brockhaus.

Kützing, F.T. (1854). *Tabulae phycologicae*; oder, Abbildungen der Tange. Vol. IV pp. i–xvi, 1–23, 100 pls. Nordhausen: Gedruckt auf kosten des Verfassers (in commission bei W. Köhne).

Linnaeus, C. (1745). *Flora suecica*; exhibens plantas per regnum Sueciae crescentes, systematice cum differentiis specierum, synonymis autorum, nominibus incolarum, solo locorum, usu pharmacopaeorum. pp. [i] –xii, [xiii-xvi], 1–419 [42–, err.], 1 pl.. Stockholmiae [Stockholm]: Sumtu & litteris Laurentii Salvii.

Linnaeus, C. (1753). *Species plantarum*, exhibentes plantas rite cognitas, ad genera relatas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum

systema sexuale digestas. Vol. 2 pp. [i], 561–1200, [1–30, index], [i, err.]. Holmiae [Stockholm]: Impensis Laurentii Salvii.

Mabberley, J.B. (1985). *Jupiter Botanicus*: Robert Brown of the British Museum. pp. 1–500. Braunschweig & London: J. Cramer; British Museum (Natural History).

Mabberley, D.J. (2022). Biographical sketch of Robert Brown. In: *The Robert Brown handbook, A guide to the life and work of Robert Brown (1773–1858), Scottish botanist. Regnum vegetabile Vol.* . (Mabberley, D.J. & Moore, D.T. Eds), pp. 15–21. Glashütten: Koeltz Botanical Books.

Škaloud, P., Rindi, F., Boedeker, C. & Leliaert, F. (2018). *Süßwasserflora von Mitteleuropa. Freshwater flora of central Europe. Bd 13. Chlorophyta: Ulvophyceae*(Krienitz, L. ed.). pp. [i]–vii, [1]–288, 182 figs. Berlin: Springer Spektrum.

Spencer, M.A., Irvine, L.M. & Jarvis, C.E. (2009). Typification of Linnaean names relevant to algal nomenclature. *Taxon* 58(1): 237–260.

Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F., editors (2018). *International code of nomenclature for algae, fungi, and plants (Shenzhen Code)* adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. *Regnum Vegetabile*, Vol. 159. pp. [i] –xxxviii, 1–253. Glashütten: Koeltz Botanical Books.

Fig. 1. Lectotype of *Conferva aegagropila* Linnaeus **LINN** 1277.49 (designated by Hoek 1963: 51), reproduced with permission of The Linnean Society of London. Originally filed as "globosa" referring to a pre-Linnaean polynomial, but validly published under the name *Conferva aegagropila.*

Fig. 2. Original illustration of *Conferva brownii* Dillwyn (suppl. Pl. D, *sine numero*), clearly showing the branching pattern of *Aegagropila.*

Fig. 3. Lectotype of *Conferva brownii* Dillwyn at **LD**. **Fig. 3A.** Original sheet with annotation by C. van de Hoek as "fragment of TYPUS" with original material in the yellow envelope. **Fig. 3B** (insert) fragment of type picked out by C. van den Hoek in white package (scale on insert – 1 mm).