

**A nomenclatural analysis of the genus name *Rhodophyllis* (Cystocloniaceae, Rhodophyta)**

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This nomenclatural analysis of the genus name *Rhodophyllis* Kützinger (1847: 23) (Cystocloniaceae, Rhodophyta) was initiated after inadvertent inaccuracies/oversights/ shortcomings were detected in several older analyses (e.g., Papenfuss 1950; Silva 1952) predating the current *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code)* [ICN (Turland *et al.* 2018)]. This study parallels a similar one (Woelkerling & al. 2020) of species names historically linked at some stage to *Rhodophyllis bifida* (J.V. Lamouroux) Kützinger [as ‘*Rh. bifida* Kg.’ in Kützinger (1847: 23)], the species name whose nomenclatural type (ICN Art. 10.1) typifies *Rhodophyllis*.

Our analysis, including nomenclatural terminology, is based on the current ICN (Turland & al. 2018). Herbarium abbreviations are those in the online database *Index Herbariorum* (<http://sweetgum.nybg.org/science/ih/>). The triple-bar symbol “≡” denotes names that are based on the same nomenclatural type (Turland 2019: 167) and thus are homotypic; the double-bar symbol “=” denotes names that are based on the different nomenclatural types (Turland 2019: 167) and thus are heterotypic. References to both the journal and the independently paginated offprint versions of several publications are included because of citations of the latter by some authors.

Dates of effective publication have been determined in accordance with ICN Art. 31.1 (also see Art. 14.15). The use of double quotation marks to indicate binary designations (as defined in the ICN glossary), which are not validly published names, follows Turland *et al.* (2018: 205). Correct author citations for species names comply with ICN Art. 46–50. Author citation errors do not affect valid publication of new names, new combinations, names at a new rank or replacement names (Art. 41.3, 41.6). Turland (2019: 95–99) provides further information on author citations.

Interpreting 18th and 19th century nomenclatural actions (which can be cryptic) in the context of 21st century ‘rules’ requires care to ensure the correct application of scientific names and the correct citations of authors. Although some ideas pertaining to botanical nomenclature were proposed in the 18th and early 19th centuries (e.g., Lamarck 1795–1796; A.P. de Candolle 1813: 221–252; Smith 1821: 51–54; Lindley 1832: 454–462; see Nicolson 1991, Turland 2019: 146–149), no formal *Code* for naming botanical organisms existed before 1867 (A. de Candolle 1867a; 1867b; 1868).

Numerous changes to the *Code* have occurred since 1867 (see Overview of editions of the *Code*, <https://www.iapt-taxon.org/historic/index.htm>; site created and currently maintained by Paul van Rijckevorsel). Important changes affecting the nomenclature of *Rhodophyllis* include:

1. the introduction and adoption (Merrill 1930: 567) at the *International Botanical Congress of Cambridge* (16–23 August 1930) (*Cambridge Rules*, Harms 1935: Art. 18) (= *Shenzhen*

Code Art. 7.1; also see Principle II) of the type method of determining the application of names to taxa;

2. the introduction and adoption at the *Ninth International Botanical Congress* (Montreal, Canada, August 1959) (*Montreal Code*, Lanjouw *et al.* 1961: Art. 48) (= *Shenzhen Code* Art. 48) of the rule involving explicit exclusion of types resulting in later homonyms; and
3. the introduction and adoption at the *Thirteenth International Botanical Congress* (Sydney, Australia, August 1981) (*Sydney Code*, Voss *et al.* 1983: Art. 10.1) (= *Shenzhen Code* Art. 10.1) of the present unambiguous provision that “the type of a name of a genus ... is the type of a name of a species”.

Changes to the ‘rules’ in successive editions of the *Code* become effective immediately upon acceptance at the closing plenary session of each Congress (Turland & al. 2018: Preface, p. x; Turland 2019: 141), not on the subsequent date of publication of the revised *Code*. Dates of effective publication of proposals to conserve or protect names are determined in accordance with ICN Art. 14.15, including Note 4.

The protologue of *Rhodophyllis* Kützing (1847: 23) (reproduced here as Fig. 1) includes a genus description, explicit mention of two species names that are homotypic (Woelkerling & al. 2020), and a reference to W.H. Harvey’s *Phycologia Britannica* pl. XXXII (Harvey 1846), which contains an account and illustrations of *Rhodymenia bifida* (J.V.Lamouroux) Greville (1830: xlviii, 85, as *Rhodomenia bifida* Grev.). The spelling ‘*Rhodymenia*’ is nomenclaturally conserved (Wiersema *et al.* 2015: 76 [in print]; Wiersema *et al.* 2018+ [online, continuously updated]).

34. *Rhodophyttis* Kg. (nov. gen.) *Phycoma* sursum membranaceum, parenchymaticum, e stratis duobus compositum. Stratum internum e cellulis majoribus constitutum. *Cystocarpia* exserta, globosa, sessilia, spermatis angulato-globosis, in glomerulos uvaeformes aggregatis, spermopodio centrali radiatim flocculoso affixis farcta. *Tetrachocarpia* in phyllomate sparsa quadrijuga!

***Rh. bifida* Kg. = *Rhodomenia bifida* Grev.**

Anmerk. Die Vierlingsfrüchte sind in Harvey’s *Phycologia britannica* Pl. XXXII. Fig. 9. richtig dargestellt; die Analyse der Kapsel Frucht (Fig. 6.) lässt aber alles zu wünschen übrig.

Fig. 1. Protologue of *Rhodophyllis* Kützing (1847: 23), reproduced here from the original publication (details in references).

Kützing’s generic name is correctly spelled *Rhodophyllis*. The apparent protologue spelling (Fig. 1) “*Rhodophyttis*” in Kützing (1847: 23) (at least in the journal copy consulted) is treated as a correctable typesetting/printing problem (error) (ICN Art. 60.1) in which the italicized letter “*l*” sometimes looks like a “*t*” in print (e.g., on p. 23, in the entry for species 36 & 37, the genus name is *Calophyllis*, while for number 38 the genus name looks like “*Calophyltis*”). Elsewhere, Kützing (1849: 786, 917; 1869: 18) consistently used *Rhodophyllis*, as did other contemporary authors (e.g.,

Montagne 1851: 107; 125; J. Agardh 1852: 387; Harvey 1853:151; Crouan & Crouan 1867: 145; Pfeiffer 1874: 957).

Rhodophyllis is necessarily typified by the only eligible type (Art 10.1, 10.2) included in the protologue, that of the homotypic *Rhodophyllis bifida*/*Rhodymenia bifida* (Greville 1830: 85). Neither Kützinger (1847) nor Greville (1830), however, designated or indicated a nomenclatural type specimen/illustration, and apparently, formal typification in accord with the current ICN of *R. bifida* (and thus *Rhodophyllis*) did not occur until Woelkerling & al. (2020). Because (ICN Principle II; Art. 7.1) application of scientific names to all taxa of family rank or lower is determined by means of nomenclatural types (specimens or illustrations), past nomenclatural interpretations involving the genus name *Rhodophyllis* have lacked underpinning evidence essential for nomenclatural stability and consequently are speculative.

Although almost always recognized as a distinct genus of Rhodophyta since first described, *Rhodophyllis* Kützinger (Kützinger 1847: 23) has had a complex nomenclatural history. *Rhodophyllis* was formally proposed for conservation against *Bifida* Stackhouse (1809: 95, 97) by Børgesen & al. (1909: 324) without remarks or mention of types but with the approval of 33 additional phycologists (listed on p. 325). Earlier, without mention of types, Trevisan (1845: 63 listed *Bifida* as a synonym of *Rhodymenia*, whereas Le Jolis (1856: 76) treated *Bifida* as a synonym of *Rhodophyllis* as did De Toni (1897: 339). By contrast, Kuntze (1891: 886; 1898: 397) treated *Rhodophyllis* as a synonym of *Bifida*. The Børgesen & al. (1909) proposal was accepted on 10 May 1910 at the International Botanical Congress in Brussels [ICN Art.14, Note 4(b); Farlow & Atkinson 1910], and included in the *Brussels Rules* (Briquet 1912: 77), well before the introduction in 1930 (see above) of the type method of determining the application of names.

The application of the names *Rhodophyllis bifida* and *Rhodophyllis* became complicated because of the various usages of the name *Fucus bifidus*, a binomial cited by Greville (1830: 85) in his account of *Rhodymenia bifida* (Fig. 2). As noted by Woelkerling *et al.* (2020), the earlier references to

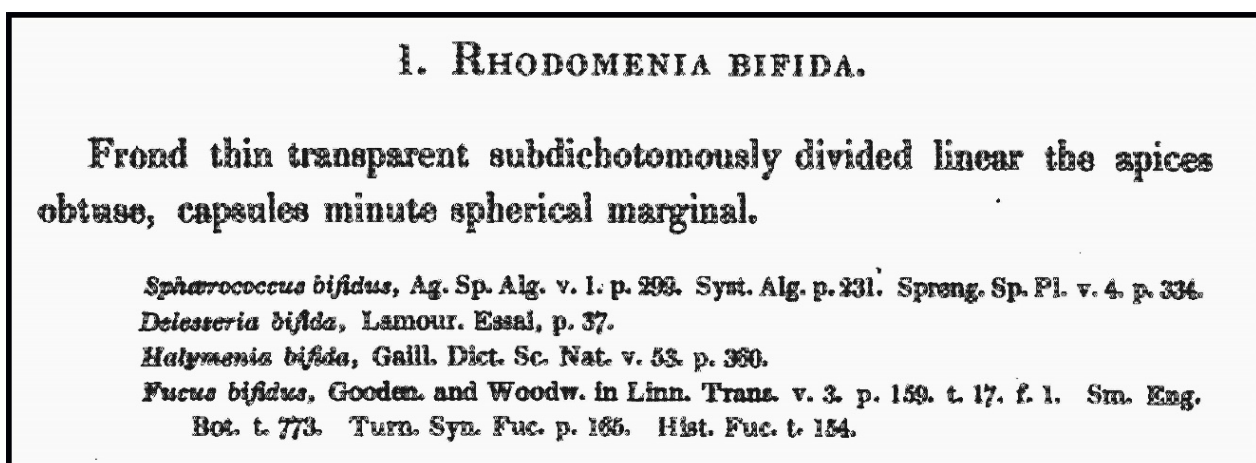


Fig. 2. Brief description & synonymy for *Rhodymenia bifida*, reproduced from Greville (1830: 85, as *Rhodomenia*) Publication details in references.

Fucus bifidus by Greville (1830) either involve the name *F. bifidus* Hudson (Hudson 1778: 581) or the name *F. bifidus* Turner (Turner 1811: 43), both of which are validly published but illegitimate later homonyms of *F. bifidus* S.G. Gmelin (Gmelin 1768: 201) [= *Arthrothamnus bifidus* (S.G.Gmelin) J.Agardh (1868: 28) (*Laminariales*, *Ochrophyta*)].

Woelkerling *et al.* (2020) concluded that Goodenough & Woodward (1797), Smith (1800), and Turner (1802), all cited by Greville (1830: 85), apparently had misapplied the name *F. bifidus* Hudson (1778: 581) to a different species from that described by Hudson. The ‘different species’ was subsequently described as *Fucus bifidus* Turner (Turner 1811: 43), whose name constitutes the second illegitimate homonym of *F. bifidus* S.G. Gmelin (1768). Turner (1811) created the homonym by explicitly excluding the Hudson species and the Gmelin species from *Fucus bifidus* Turner. As illegitimate names, *F. bifidus* Hudson and *F. bifidus* Turner cannot serve as basionyms for *Rhodophyllis bifida* because basionyms, by definition (Art. 6.10; ICN Glossary), must be legitimate. However, as shown by Woelkerling *et al.* (2020), the type of *Rhodophyllis bifida* (and thus of the genus name *Rhodophyllis*) ultimately is based on the original material of *Fucus bifidus* Turner and not of *F. bifidus* Hudson or *F. bifidus* S.G. Gmelin.

Although the first phycologists to review *Rhodophyllis* and its conservation (Papenfuss 1950; Silva 1952) were aware of the above misapplication, they do not appear to have appreciated that Turner in 1811, unlike in 1802, explicitly excluded *Fucus bifidus* Hudson from his treatment of *F. bifidus* Turner, thus publishing a later homonym as described in ICN Art. 48.1. Although this is implicit in type-based nomenclature, the explicit provisions of ICN Art. 48 only first appeared in the *Montreal Code* (Lanjouw & al. 1961). This may help explain the oversight of Papenfuss (1950) and of Silva (1952). Likewise, neither Papenfuss nor Silva appear to have realised that Greville (1830: 88), by simultaneously and explicitly including *Fucus bifidus* Hudson in another species [*Rhodymenia palmetta* (Stackhouse) Greville], excluded it (ICN Art. 48.1, final sentence) from *Rhodymenia bifida* (Greville 1830: 85), thereby making the Greville name a legitimate name. Thus, the name *Rhodophyllis bifida* of Kützinger (1847: 23), whose nomenclatural type typifies the genus name *Rhodophyllis*, is derived from the legitimate *Rhodymenia bifida* (Greville 1830: 85), and therefore both *Rhodophyllis bifida* and *Rhodophyllis* also are legitimate names.

A further complication is that when Silva (1952) published his “review of nomenclatural conservation in the algae from the point of view of the type method”, the *Code* still contained the inherently ambiguous provision that ‘The type of a name of a genus ... is a species’ (see Harms 1935: Art. 18; Lanjouw & al. 1952: Art. 20). Some took this to mean the species named by the author, but others took the view that it should be the species actually studied by the author, which might be different. Not until the Sydney Congress in 1981 (Voss 1983: Art. 10.1) was the present unambiguous definition adopted, namely, that “the type of a name of a genus ... is the type of a name of a species.”

Despite the fact that the nomenclatural type (specimen/illustration) of *R. bifida* is the obligate type of the genus name *Rhodophyllis* (ICN Art. 10.2), Silva (1952: 264) listed the type of the genus as “Type species: *R[hodophyllis]. bifida sensu* Kütz. ... [non *Fucus bifidus* Huds. = *Rhodymenia pseudopalmata* (Lamour.) Silva] = *R. divaricata* (Stackh.) Papenf. ...”. Beginning with the *St Louis Code* (Greuter *et al.* 2000: 179), editions of the *Code*, including the latest printed version of the Appendices (Wiersema *et al.* 2015: 76) and the current (5 June 2020) online version of Appendix III (Wiersema *et al.* 2018+ [continuously updated]) have listed (see Fig. 3) *Rhodophyllis bifida* as an illegitimate name based ultimately on the illegitimate *Fucus bifidus* Turner (Turner 1811: 43), and on that basis reported that the correct name for the species to which the type (i.e. that of *Fucus bifidus* Turner) belonged was *Rhodophyllis divaricata* (Stackhouse) Papenfuss.

Silva (1952: 264) listed *Bifida divaricata* Stackhouse (1809: 97), the basionym of *Rhodophyllis divaricata*, as the ‘lectotype species’ of the genus *Bifida*, but no nomenclatural type specimen or illustration was designated for either *Bifida divaricata* or *Rhodophyllis bifida* until both species

names were typified by Woelkerling *et al.* (2020), who also determined that those two species were not conspecific.

<i>Rhodophyllis</i> Kütz. in Bot. Zeitung (Berlin) 5: 23. 8 Jan 1847. Typus: <i>R. bifida</i> Kütz., nom. illeg. (<i>Fucus bifidus</i> Turner 1811, non S. G. Gmel. 1768, nec Huds. 1778, <i>Bifida divaricata</i> Stackh., <i>R. divaricata</i> (Stackh.) Papenf.).	(=)	<i>Bifida</i> Stackh. in Mém. Soc. Imp. Naturalistes Moscou 2: 95, 97. 1809 (typ. des.: Silva in Univ. Calif. Publ. Bot. 25: 264. 1952).
	(=)	<i>Inochorion</i> Kütz., Phycol. General.: 443. 14–16 Sep 1843. Typus: <i>I. dichotomum</i> Kütz.

Fig. 3. Current entry for *Rhodophyllis* in Appendix IIIA, as accessed and downloaded 5 June 2020 from <https://naturalhistory2.si.edu/botany/codes-proposals/>. Online content updated continuously and thus subject to change without notice.

Based on the data presented in this analysis and in Woelkerling *et al.* (2020), the entry for *Rhodophyllis* in Appendix III of the *Code* should be updated as shown in Fig. 4.

<i>Rhodophyllis</i> Kütz. in Bot. Zeitung (Berlin) 5: 23. 8 Jan 1847. Typus: <i>R. bifida</i> (J.V. Lamour.) Kütz. (<i>Delesseria bifida</i> J.V. Lamour. in Ann. Mus. Natl. Hist. Nat. 20: 125. 1813).	(=)	<i>Bifida</i> Stackh. in Mém. Soc. Imp. Naturalistes Moscou 2: 95, 97. 1809 Typus (vide Silva in Univ. Calif. Publ. Bot. 25: 264. 1952): <i>B. divaricata</i> Stackh.
	(=)	<i>Inochorion</i> Kütz., Phycol. General.: 443. 14–16 Sep 1843. Typus: <i>I. dichotomum</i> Kütz.

Fig 4. Proposed updated entry for ICN Appendix III. Full publication details in references.

This analysis of the genus name *Rhodophyllis* Kützing (1847: 23) has led to the following outcomes:

1. The protologue spelling “*Rhodophyttis*” in Kützing (1847: 23) is treated as a typesetting/printing problem (error) (ICN Art. 60.1) correctable to *Rhodophyllis*, the spelling consistently used subsequently by Kützing and all other authors.
2. *Rhodophyllis* is necessarily typified by the only eligible type (ICN Art 10.1, 10.2) included in the protologue, that of the homotypic *Rhodophyllis bifida* and *Rhodymenia bifida*.
3. *Rhodophyllis* Kützing (1847: 23) was conserved against *Bifida* Stackhouse (1809: 97) without remarks or mention of types, and nomenclatural types were not properly designated for either name until Woelkerling & al. (2020).
4. Due to inadvertent errors in earlier reviews of *Rhodophyllis* and its conservation, *Rhodophyllis* and *Bifida* have been treated as homotypic synonyms in Appendix III of the ICN but this requires updating as the two names are based on different types.
5. The entry for *Rhodophyllis* in ICN Appendix III also needs updating to indicate that the name of the species whose type typifies the genus name *Rhodophyllis* is the legitimate name *Rhodophyllis bifida* (J.V.Lamouroux) Kützing, not “*R. bifida* Kütz, nom. illeg.”, and the same entry also needs updating to remove the name “*R. divaricata* (Stackh.) Papenf.”, which is not the correct name of the species whose type typifies *Rhodophyllis*.



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