

## The *Potamogeton* L. taxa described by Alfred Fryer

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### ABSTRACT

The twelve *Potamogeton* L. taxa described by Alfred Fryer (1826–1912) are listed, their lectotypes cited, Fryer's reasons for regarding them as new discussed and their subsequent taxonomic treatment outlined. The composition of Fryer's *Potamogeton* herbarium at the time of his death is indicated and its later fate described. The work of J. E. Dandy and G. Taylor on the genus is briefly reviewed.

### INTRODUCTION

Alfred Fryer (1826–1912) became interested in the genus *Potamogeton* L. in the early 1880s. For the next twenty years he studied the Pondweeds growing in the Fenland around his home at Chatteris in Cambridgeshire, observing them in the field and cultivating them in his garden. His own fieldwork was almost confined to Fenland, but plants were sent to him from further afield by other botanists. After 1900 his studies became less intensive, although he remained interested in the genus until his death at the age of 85. I have prepared a reassessment of his work on *Potamogeton* for publication elsewhere (Preston, in press). In the following account numeral superscripts refer to the 'Notes' at the end.

During the course of his studies Fryer described twelve new *Potamogeton* taxa.<sup>1</sup> The first three were based on material from Fenland. As he came to know the local forms in this area, he realized that several did not correspond with the usual forms of species then recognized. When describing these variants as new, he was faced with the problem of choosing the most appropriate taxonomic rank for them. This is discussed in one of his early papers, in which he concluded that it was most convenient to allocate full specific rank to each variant that was worthy of separation (Fryer 1886). He reiterated this view three years later (1889b), when he wrote "what is a *distinct species* in *Potamogeton*? No one really knows . . . let us name all definable forms the origin of which we cannot reasonably trace; this will lead to their examination and study, and possibly to direct experiment in crossing certain species, by which alone many questions can be solved". As this implies, Fryer was aware that his arrangement was a provisional one, "leaving the final settlement of their rank to the time when the whole genus shall be better known" (Fryer 1889a). Amongst the local variants which Fryer described were *P. varians* (1887), *P. falcatus* (1889c) and *P. crassifolius* (1890c).

By 1890 Fryer had realized that hybridization was more significant in *Potamogeton* than had hitherto been realized (Fryer 1890a). He reinterpreted as hybrids several of the Fenland plants with which he was familiar, and described as new *P. × billupsii* (1893). At the same time he was becoming known as a national authority on the genus, and so began to receive material collected by other botanists. He thus came to describe the hybrids *P. undulatus* var. *cooperi* (1891, but recombined as *P. × cooperi* in 1897), *P. × bennettii* (1895) and *P. × lintonii* (1900b).

Fryer decided to treat variants of hybrids at the rank of *forma* "when a distinct result is obtained by the interbreeding of the same parents, or in cases where the parents are reasonably supposed to be the same" (Fryer 1898a). (The 'notho-' prefix would be used in such cases today.) He described *P. nitens* f. *involutus* (1896), *P. crassifolius* f. *verrutus* (1898a) and *P. polygonifolius* f. *cancellatus* (1898a).

No comprehensive account of Fryer's taxa has been published. The purpose of this paper is to outline the history of Fryer's herbarium and to list all the taxa described by Fryer, detailing their

typification and modern taxonomic treatment. In doing this I have relied to a considerable degree on the taxonomic revision of the British *Potamogeton* species carried out over many years by the late J. E. Dandy and Sir George Taylor. I have therefore included a brief review of their work, with particular emphasis on the unpublished sources of information about it.

#### FRYER'S HERBARIUM

Fryer collected his first specimens of *Potamogeton* on 16 June 1880. He subsequently amassed a large herbarium, mainly of plants he collected himself. These were beautifully pressed and accurately annotated. Fryer was not unaware of the scientific value of this material (Evans & Britten 1912), and he explained his strong views about its future to James Britten of the British Museum's Botany Department:<sup>2</sup>

"I hope shortly to send you a parcel of specimens of these plants for the Museum Herbarium. You may perhaps be able to call to mind that I once said my collection of Pots would ultimately be placed there. Now it has acquired such importance in my eyes that I am unwilling that it should be broken up or *distributed through a general collection*. If you could see my Herbarium of these plants and have the method on which it has been collected explained to you I think you would quite understand how the value of such a set of plants would be destroyed by dispersing it through another Herbarium. For instance *P. varians* is followed up *year after year* and *month after month* in various localities round Chatteris until 3 or 400 sheets are filled with its states and forms. Miss out of (*sic*) ten of these specimens (of little value separately) would be called *duplicates* in any Herbarium arranged in the usual manner – but as I have them (and hope *some one will keep them*) they show all sorts of curious facts in life-history as *a hot week; a rainy week; artificial irrigation*; etc. etc. all facts of inestimable value in showing *why Pots vary* – and how our so-called 'species' are formed."

When Fryer died in February 1912 his *Potamogeton* specimens were given to Charles Bailey, the Manchester amateur botanist, for his lifetime, then to the British Museum (Evans & Britten 1912). Bailey, having enumerated the 5450 specimens of *Potamogeton* and allied genera (see Appendix), decided to pass the collection to the Museum without further delay. By 24 May 1912 he was able to write that "the *Potamogetons* have all gone to South Kensington [BM] so that the authorities there may settle what they wish to retain. Owens College [MANCH] gets the next choice, and then Cambridge University [CGE]".<sup>3</sup> The specimens which remained after these institutions had taken what they wanted were widely distributed, some even to private collectors (e.g. S. H. Bickham, whose herbarium was eventually donated to CGE).

Eighteen months after her father's death, Miss Rose Fryer was disappointed when she visited the British Museum to see his collection:<sup>4</sup>

"A fortnight ago I went to Cromwell Rd and had the temerity to ask to see the Fryer *Potamogetons*. I was informed they were not yet arranged for the use of students, but on giving my name, Mr Baker took me to a room where the collection was lying in a big heap on a bench – covered with a cloth. The methods at the Brit. Museum of Nat. History seem somewhat dilatory – but I suppose 'Red Tape' pervades anything. I could not help thinking of the excessive care my poor father had bestowed upon his collection and I can only trust it may be useful 'some day'."

She subsequently wrote to G. C. Druce "Please do use all your great influence, and the weight of your opinion, in order that justice may be done in this matter".<sup>5</sup> In view of the poor relations between Druce and the British Museum botanists (Allen 1986), it is unlikely that Druce's representations would have been well received.

The typification of Fryer's names is complicated by the fact that some specimens of *Potamogeton* were destroyed and others badly damaged when the British Museum was hit by incendiary bombs on 9 September 1940 (cf. Stearn 1981). In addition to specimens belonging to BM, those on loan to Dandy and Taylor from some other institutions were affected. Some specimens cited as being at BM in the Dandy Index, including at least one Fryer lectotype, cannot now be found in the herbarium. I have assumed that these were destroyed in the war. Many specimens which were damaged but not destroyed are stored separately, not incorporated into the herbarium. Other Fryer specimens which are undamaged but unmounted are kept with them. If any of the specimens that I have assumed were destroyed are ever discovered, the decisions I have made about

typification may have to be reviewed. Because of the doubt about the continued existence of specimens seen by Dandy and Taylor before the War, I have used the symbol '!' to indicate that I have seen a specimen of the collection cited.

Fryer's specimens of other genera were split between Bailey and Druce. Bailey thought that these Fenland plants would be most appropriately placed in Cambridge, and suggested to Druce that they should both send the material they had received to the University herbarium. Druce must have refused, as by September 1912 Bailey was incorporating the plants he had received from Fryer into his British herbarium.<sup>6</sup>

#### DANDY AND TAYLOR'S STUDIES OF *POTAMOGETON*

In 1937 J. E. Dandy and G. Taylor of the British Museum (Natural History) began to co-operate in a study of the British *Potamogeton* species. Taylor had collected *Potamogeton* specimens during the British Museum Expedition to East Africa (1934–35). Dandy worked through this collection, which contained several British species, when preparing his account of the tropical African *Potamogeton* species (Dandy 1937). Together the two colleagues resolved to produce a monograph of the British species, with particular emphasis on their distribution. With this end in view they published preliminary papers in a series of 'Studies of British Potamogetons', eighteen of which appeared in *The Journal of Botany* between 1938 and 1942. In these papers the British distribution of the critical 'pusilloid' *Potamogeton* species was clearly set out for the first time, and the identity of several hitherto misunderstood species and hybrids was clarified. Taken together, these papers must represent one of the most impressive modern contributions to the taxonomy of the British flora.

Dandy and Taylor's careers diverged after the War, with Taylor leaving the British Museum for Kew in 1956. Thereafter their collaboration became more difficult, and with both men being expected to undertake an increasing burden of administrative work it proved impossible to complete the proposed monograph (Taylor 1977). However, after his retirement Dandy published the account of *Potamogeton* in *Flora Europaea* (Dandy 1980) and an invaluable treatment of the British hybrids (Dandy 1975).

The taxonomy of the genus adopted in this paper is that of Dandy and Taylor. All the taxa published by Fryer at specific rank, or subsequently raised to this rank, are cited by Dandy (1958, 1975) as valid names or synonyms. For infraspecific taxa, and for detailed information on many of the species, it has been necessary to consult Dandy and Taylor's unpublished work. I have used the following sources in preparing this paper:

- 1) Herbarium specimens in **BM**, **CGE** and **MANCH**.
- 2) The 'Dandy Index', a card index held in the Botany Department, British Museum (Natural History), which details herbarium specimens examined by Dandy and Taylor or (in later years) by Dandy alone. During the course of their studies Dandy and Taylor determined the specimens in most of the more significant national herbaria. The card index includes details of most of the specimens they examined, although some appear not to be included. It was compiled by Dandy and maintained until his death in 1976.
- 3) A manuscript monograph "British species of *Potamogeton* L." by Dandy and Taylor. Dandy's annotated copy is held in the Botany Department library, British Museum (Natural History); Sir George Taylor's is in his own possession. This draft monograph is particularly valuable for its bibliography and for the extensive synonymy cited for each species. It was written in the 1940s, and consequently the taxonomic and distributional evidence is superseded by Dandy's (1958, 1975, 1980) later published works, the distribution maps based on specimens determined by Dandy and Taylor (Perring & Walters 1962; Perring & Sell 1968) and the specimens cited in the Dandy Index.

#### THE *POTAMOGETON* TAXA DESCRIBED BY FRYER

For each of the taxa described by Fryer, I have briefly outlined the reasons which led him to describe it as new, considered the typification and added any notes on the subsequent treatment of the plant which appear relevant.

*POTAMOGETON* × *BENNETTII* Fryer in *J. Bot., Lond.*, **33**: 1 (1895).

Type: Wood Pond, Grangemouth, Stirling, 24th August 1894, R. Kidston & Col. Stirling. *A. Fryer 3001* (lectotype: **BM!**). Determined as *Potamogeton* × *bennettii* Fryer by J. E. Dandy & G. Taylor, 1937.

The sterile hybrid *Potamogeton* × *bennettii* has been considered in detail by Dandy & Taylor (1939c). Fryer (1895) thought that it was probably *P. crispus* × *obtusifolius*, but Dandy and Taylor provide a convincing justification for regarding it as *P. crispus* × *trichoides*. *P.* × *bennettii* is the correct name for this hybrid between two very dissimilar parents (Dandy 1975). The name commemorates Arthur Bennett (1843–1929), Fryer's friend and fellow student of the genus *Potamogeton*.

*Fryer 3001* is identified as the lectotype of *P.* × *bennettii* in the Dandy Index, and the specimen cited above is labelled as the lectotype in **BM**.

*P.* × *bennettii* is confined to the Forth & Clyde Canal system (Perring & Sell 1968; Dandy 1975). It is not known outside the British Isles. The morphologically similar hybrid *P.* × *lintonii* (q.v.) is more often found in canals than in other habitats, but is much more widespread.

*POTAMOGETON* × *BILLUPSII* Fryer in *J. Bot., Lond.*, **31**: 353 (1893).

Type: Cultivated root from Parsonware Drove, Benwick, Cambridgeshire, 1892. *A. Fryer 2245* (lectotype: **BM!**).

Fryer based *Potamogeton* × *billupsii* on a single plant which he found in 1892. It grew in shallow water amongst a mass of *P. coloratus* and *P. zizii* at Benwick (Fryer 1893, 1898b). This plant was later destroyed by the deepening of the ditch in which it grew, but Fryer had by then taken it into cultivation. When grown in shallow water it produced abundant flower spikes, which proved to be "absolutely barren". Fryer believed that it was a hybrid between *P. coloratus* and *P. zizii*. (*P.* × *zizii* is itself a hybrid between *P. gramineus* and *P. lucens*. It is the only British *Potamogeton* hybrid which produces well-formed fruit.) He named it after Christopher Robert Billups (1861–1938), his nephew, who assisted him in the study of pondweeds.

The specimen cited as lectotype above was selected by Dandy and Taylor (Dandy Index), and is labelled as such in **BM**. It is the original of one of the plates (tab. 338) that illustrated Fryer's description of *P.* × *billupsii*. Robert Morgan's coloured drawing for the plate is attached to the specimen.

Dandy and Taylor accepted that *P.* × *billupsii* was a hybrid, but regarded the parents as *P. coloratus* and *P. gramineus*. *P.* × *billupsii* is the correct binomial for this hybrid (Dandy 1975).

Fryer's 1892 record of *P.* × *billupsii* from Benwick is still the only substantiated record from eastern England. Fryer himself (1893, 1898b) mentioned a plant which he collected in 1892 at Sutton Meadlands, Cambs., and which he thought was probably *P.* × *billupsii*. I have not been able to trace this specimen, nor can it be identified with any recorded in the Dandy Index. In its absence the record cannot be accepted, especially as Fryer was himself uncertain of its identity. The reports of *P.* × *billupsii* from Burwell, Cambs. (Evans 1911, 1939) and Ramsey St Mary's, Hunts. (*Rep. botl Soc. Exch. Club Br. Isl.*, **2**: 400 (1909), Druce (1926)) are based on specimens later identified as *P. gramineus* by Dandy and Taylor. However *P.* × *billupsii* is known from Benbecula, Outer Hebrides, where it was first collected in 1940 and has been refound on several occasions.

*POTAMOGETON CRASSIFOLIUS* Fryer in *J. Bot., Lond.*, **28**: 321 (1890).

Type: The Engine Drain, Mepal, Cambridgeshire, 7 July 1890. *A. Fryer 1656* (lectotype: **BM!**). Determined as *Potamogeton* × *fluitans* Roth by J. E. Dandy & G. Taylor, 1938.

*Potamogeton crassifolius* was described by Fryer (1890c) as a sterile hybrid resembling *P.* × *fluitans*, but whereas *P.* × *fluitans* has the parentage *lucens* × *natans*, Fryer thought that *P. crassifolius* was a hybrid between *zizii* (i.e. *lucens* × *gramineus*) and *natans*. In addition to pointing out the morphological differences between *P. crassifolius* and *P.* × *fluitans*, he supported this suggestion with evidence drawn from the distribution of *P. crassifolius*.

Fryer (1890c) recorded *P. crassifolius* from three Cambridgeshire parishes, Chatteris, Mepal and

Doddington. He discussed two localities in detail: Mepal Engine Drain, in which the type variant of the species grew, and Westmoor, Doddington, where the population differed slightly. Fryer (1898a) later named the Westmoor plant f. *verrutus* (see below). The lectotype should be based on the Engine Drain plant which Fryer regarded as typical. *Fryer 1656*, a widely distributed collection, is designated as the lectotype in Dandy's Index. Although no specimen is actually labelled as a lectotype in **BM**, one sheet is enclosed in a Type Specimen folder, doubtless because it was Dandy's choice of lectotype. It is an entirely appropriate selection and I have now labelled it as the lectotype.

In his final treatment of *P. crassifolius*, Fryer (1898a) regarded it not simply as *P. × zizii × P. natans* but as *P. coriaceus × P. natans*. He thought of *P. coriaceus* as the backcross between *P. × zizii* and *P. gramineus*.

The lectotype and the other specimens in **BM** originally labelled by Fryer as *P. crassifolius* have been determined as *P. × fluitans* by Dandy and Taylor.

*POTAMOGETON CRASSIFOLIUS* Fryer f. *VERRUTUS* Fryer, *Potamoget. Brit.*, 9 (1898), ('*verruta*').

Type: Cultivated plant from Westmoor, Doddington, Cambridgeshire, 6 September 1890. *A. Fryer 1735* (lectotype: **BM!**). Determined as *Potamogeton × fluitans* Roth by J. E. Dandy & G. Taylor, 1938.

In his original description of *Potamogeton crassifolius*, Fryer (1890c) pointed out that the population at Westmoor, Doddington, differed from the typical plant in leaf characters, being closer to one of the putative parents, *P. natans*. By the time he prepared the description of *P. crassifolius* for his monograph, Fryer (1898a) had studied the Westmoor plant in cultivation for eight years. On the basis of these observations he described the Westmoor plant as f. *verrutus*.

The specimen cited above is noted as lectotype in the Dandy Index and labelled as such in **BM**. It is the original of the lower figure on Plate 5 of the monograph by Fryer & Bennett (1915), which illustrated the description of f. *verrutus*.<sup>7</sup>

In classical latin the adjective *verrutus* (or *verutus*) is used only in a military sense, and means "armed with a javelin". It is rare in botanical latin, and Fryer does not explain its relevance to the Westmoor population of *Potamogeton crassifolius*. He probably intended it to refer to the plant's very long lanceolate or oblanceolate submerged leaves, which are well illustrated in the plate cited above.

*POTAMOGETON DRUCEI* Fryer, *Potamoget. Brit.*, 31 (1898), *pro hybr.*

Lectotype: Plate 21, fig. 1, in the version of Fryer, *Potamoget. Brit.* (1898), with colour plates.

*Potamogeton drucei* was named by Fryer (1898b) in honour of G. C. Druce (1850–1932), who discovered the plant in the R. Loddon, Berkshire, in 1893. When he published the description Fryer thought that the plant was probably a hybrid between *P. alpinus* and *P. natans*. His subsequent views, and the opinions of other British and European botanists, are chronicled by Dandy & Taylor (1939a). No consensus about its identity was reached until Dandy & Taylor (1939a) demonstrated that it is identical to *P. nodosus*, a widespread species in Europe and elsewhere.

Dandy and Taylor did not select a lectotype of *P. drucei*. Fryer received material collected by Druce in 1893, but this was "badly dried and wanted roots and lower leaves". The specimens were so inadequate that Fryer regarded them as indistinguishable from *P. × fluitans* (Fryer 1898b). He subsequently received better specimens and living plants (which he cultivated). His description of *P. drucei* was based on these. However, the only specimen he cited specifically was Druce's inadequate original collection. The illustration (Plate 21) which accompanied his description was drawn from a fresh specimen collected in the R. Loddon by Druce in September 1898; a young leaf from a cultivated plant was also illustrated.

Four specimens of *P. nodosus* from Fryer's herbarium survive in **BM**, in addition to a packet of fruits collected after the description of *P. drucei* in 1898. Although the lower edge of all four sheets has been burnt, the date of collection is still legible on three. These were gathered by Druce in the R. Loddon in June, July and August 1893. The date of the fourth specimen has been burnt away,

but it appears from the surviving portion of the label to be a duplicate of the specimen collected in August. None of these specimens is actually labelled as *P. drucei*, and in view of the dissatisfaction expressed by Fryer with Druce's 1893 specimens, it does not seem advisable to select one of these as a lectotype. Druce did not collect any material between 1894 and 1897. None of the specimens he collected in 1898 and now present in **BM**, **CGE** or **MANCH** were acquired from Fryer's herbarium. None of the 1898 specimens in Druce's herbarium (**OXF**) bears any indication that it was examined by Fryer. The letters which Fryer wrote to Druce about *P. drucei* are preserved with Druce's specimens in **OXF**, and extracts from them have been published (Druce 1920). They show that Fryer's later opinion of *P. drucei* was almost entirely based on the living material which he received from Druce in 1898 and cultivated at Chatteris.<sup>8</sup> In the absence of a satisfactory specimen available for selection as lectotype, I have chosen the excellent illustration, drawn by Robert Morgan, which is cited above.

G. C. Druce became very attached to the pondweed named after him. He was photographed inspecting it in the River Stour (Allen 1986, p. 135) and it was used as a motif in the bookplate presented to him by admiring members of the Botanical Exchange Club (Anon. 1926). Druce (1927) himself did not fail to point out that it was carved in stone in the University Museum, Oxford, where it can still be seen. It is perhaps fortunate that he did not live to see it reduced to a synonym of *P. nodosus*.

*POTAMOGETON FALCATUS* Fryer in *J. Bot., Lond.*, **27**: 65 (1889).

*P. gramineus* var. *falcatus* (Fryer) Druce, *List Brit. pl.*, 2nd ed., 116 (1928).

Type: Stocking Fen, Ramsey, Huntingdonshire, 21 July 1888. *A. Fryer 1131* (lectotype: **CGE!**).

Determined as *P. gramineus* L. by C. D. Preston, 1986.

*Potamogeton falcatus* was described by Fryer (1889c) from a single locality, Stocking Fen, Ramsey, Hunts. Fryer described it as a species because he was unable to ascribe it to any of the taxa then recognized. It differed from *P. gramineus* in having amplexicaul leaves, which gave it a close resemblance to *P. × nitens* (*P. gramineus* × *perfoliatus*). Fryer was advised by W. H. Beeby to include it as an intraspecific variant of *P. × nitens*, and subsequently the similarity was noticed by N. E. Brown (Fryer 1890b) and G. Tiselius (Fryer 1892a). However by 1889 Fryer had realized that *P. × nitens* was a sterile hybrid, whereas *P. falcatus* produced fertile fruit.

At one stage Fryer (1892a) contemplated a further note on *P. falcatus*, but this never appeared. We do not know his later views on the nature of the plant. In 1896 he referred to it as an "obscure and doubtful species". The discussion of *P. falcatus* in the posthumously published section of his monograph (Fryer & Evans 1913) is derived from his original paper, but Evans noted that "to the end of his life Fryer was somewhat uncertain as to the specific validity of this form".

In the Dandy Index an unnumbered specimen at **BM** collected by Fryer at Stocking Fen, Ramsey, on 11 July 1888 is selected as lectotype. This was the original of one of the figures that accompanied Fryer's description (t. 286, fig. 1). Unfortunately it is not now present in **BM**, and is not duplicated elsewhere. It is therefore necessary to select a new lectotype, which should be a fruiting specimen collected by Fryer before 1889 and labelled *P. falcatus*. I have chosen the specimen at **CGE** cited above, which closely matches the description in Fryer's protologue. It is from the herbarium of C. C. Babington, and must have been sent by Fryer to Babington before the latter's death in 1895.

The lectotype selected in the Dandy Index had been determined by Dandy and Taylor as *P. gramineus* L., and the lectotype I have now selected to replace it is also referable to this species.

*POTAMOGETON × LINTONII* Fryer in *Rep. Watson bot. Exch. Club, 1899–1900*: 21 (1900), ('*lintonii*').

Type: Canal, Renishaw, Derbyshire, July 1899. *C. Waterfall* (lectotype: **BM!**). Determined as *P. × lintonii* Fryer (type collection) by J. E. Dandy & G. Taylor.

*P. × lintonii* has been discussed by Dandy & Taylor (1939c). They agree with Fryer's opinion that it is a hybrid between *P. crispus* and *P. friesii*, adding evidence drawn from the morphology of the stipular sheaths to the arguments advanced by Fryer. The name is the correct binomial for this hybrid (Dandy 1975). It commemorates the Rev. W. R. Linton (1850–1908), author of the *Flora of Derbyshire*, who came to the same conclusion as Fryer about the hybrid nature of this plant.

Fryer's description of *Potamogeton* × *lintonii* was based on specimens collected by C. Waterfall at Renishaw in July 1899. Despite the fact that the description was published in the annual report of a Botanical Exchange Club, Dandy and Taylor only saw material of this collection in one herbarium, **BM** (*vide* Dandy Index). The single sheet now at **BM** is stamped 'Watson Botanical Exchange Club' and I have designated it as the lectotype. It must be regarded as a lectotype rather than the holotype as Fryer consistently referred to "specimens" (plural) in his protologue. There is a specimen at **SHD** which comes from Waterfall's own herbarium, and which may be an isolectotype. The details on the label differ slightly from those on the specimen at **BM**, as the collectors are given as C. Waterfall and the Rev. W. R. Linton and the date of collection as 8 July 1899.

*P.* × *lintonii* is the most frequent of the British *Potamogeton* hybrids with a parent in the narrow-leaved Sect. *Graminifolii*. It is particularly associated with canals in midland England (Perring & Sell 1968).

*POTAMOGETON* × *NITENS* Weber f. *INVOLUTUS* Fryer in *J. Bot., Lond.*, **34**: 1 (1896) ('*involuta*').

*P. nitens* f. *involutus* Fryer in *Rep. botl. Soc. Exch. Club Br. Isl.*, **1**: 461 (1895) nom. nud.

*P. nitens* var. *involutus* (Fryer) Ascherson & Graebner, *Syn. mitteleur. Fl.*, **1**: 326 (1897).

*P. involutus* (Fryer) H. & J. Groves in Babington, *Man. Brit. bot.*, 9th ed., 440 (1904).

Type: Blackbush Drain, Whittlesea, Cambridgeshire, 25 June 1895. *A. Fryer 3004* (lectotype: **BM!**). Determined as *Potamogeton* × *nitens* Weber by J. E. Dandy & G. Taylor, 1939.

In September 1894 Fryer (1894) discovered a population of *Potamogeton* × *nitens* in a drain and ditch at Blackbush Drove, Whittlesey, Cambs., which he described as "a very peculiar plant, with an extraordinary development of coriaceous floating leaves". He later (Fryer 1896) named it *P.* × *nitens* f. *involutus*, a variant differing from the usual plant in having involute submersed leaves and in the abundance of its coriaceous floating leaves. Its fruits were abortive but Fryer commented that "they are sufficiently developed to make it seem likely that in exceptional cases they may ripen and reproduce the species by seed".

When he described f. *involutus* Fryer was uncertain of its parentage, thinking that it was a hybrid between *P. perfoliatus* and either *P. gramineus* or *P.* × *zizii* (*P. lucens* × *gramineus*). In 1903 he annotated a specimen of f. *involutus* in C. Bailey's herbarium (**MANCH!**) "This is *P. zizii* × *P. perfoliatus*, therefore cannot be *nitens*. I now name it × *P. involutus*". The plant was formally raised to specific rank in the Groves brothers' edition of Babington's *Manual*, where it was given the same hybrid formula. In 1908 Fryer told E. W. Hunnybun that *P. involutus* was probably a hybrid between *P. perfoliatus* and *P. coriaceus*<sup>9</sup> (the latter he regarded as a fertile hybrid between *P.* × *zizii* and *P. gramineus*). This view is repeated in the posthumously published section of Fryer's monograph (Fryer & Evans 1913).

Fryer stated in his protologue that *P.* × *nitens* f. *involutus* "grows abundantly in Blackbush Drain and some adjacent ditches near Whittlesea, Cambridgeshire". I am not aware of any previous attempt to lectotypify this name. There are many specimens from Fryer's herbarium (**BM!**, **CGE!**, **MANCH!**) collected at Blackbush Drain in 1894 and 1895, all of which were determined as *P.* × *nitens* by Dandy and Taylor. I have selected one as a lectotype and cited it above.

*POTAMOGETON* *POLYGONIFOLIUS* Pourr. f. *CANCELLATUS* Fryer, *Potamoget. Brit.*, **21** (1898) ('*cancellata*').

*P. polygonifolius* var. *cancellatus* (Fryer) H. & J. Groves in Babington, *Man. Brit. bot.*, 9th ed., 437 (1904).

*P. oblongus* Viv. var. *cancellatus* (Fryer) Druce, *List Brit. pl.*, 2nd ed., 116 (1928).

Type: Burn of Loch Brouster above Bridge of Walls, Shetland, 19 August 1890. *W. H. Beeby 1077* (lectotype: **SLBI!**). Determined as *P. polygonifolius* Pourr. by C. D. Preston and N. F. Stewart, 1986.

In 1890 W. H. Beeby discovered a *Potamogeton* growing plentifully in the burn flowing from Brousta Loch above Bridge of Walls, Walls, Shetland. He reported it as a remarkable plant

resembling deep-water states of *P. polygonifolius* but differing in producing only a few floating leaves when growing in shallow water. Because these leaves were thinner and less coriaceous than those normally produced by *P. polygonifolius*, the plant resembled *P. coloratus*. However Beeby thought that it was a hybrid of *P. polygonifolius* and *P. gramineus*, although he admitted that "what it really is must at present be held to be uncertain" (Beeby 1891).

By the time Fryer dealt with this plant in his monograph (Fryer 1898a), he had been able to study it in cultivation at Chatteris. He confirmed that it "remains unaltered when cultivated in stagnant water, under conditions wholly differing from those of its natural station". Despite this opportunity to study the plant, he was also unsure of its identity. After quoting Beeby's account, Fryer said that at first he had "strongly inclined" to regard it as *P. coloratus*. "After further examination, and considering the fact that *P. coloratus* has not been found in the Shetland Isles, I now incline to agree with Mr Bennett in ranking this form under *P. polygonifolius* for the present. In deference to Mr Beeby's opinion as to its being possibly a hybrid, I do not use the term *var.*, but in conformity with my usage in this work prefer to employ the term *forma*, as indicating a possible hybrid origin". He therefore described it as f. *cancellatus*. Fryer regarded an Irish plant collected by R. W. Scully in 1888 in the Long Range, Killarney, Co. Kerry, as very similar, but as he had not been able to cultivate it he based his description solely on the Shetland material.

No lectotype for f. *cancellatus* has yet been proposed. Ideally it should be a Beeby specimen from Fryer's herbarium, either collected in the wild or subsequently cultivated at Chatteris. Unfortunately no such material appears to survive at **BM**, **CGE** or **MANCH**. The lectotype must therefore be selected from the specimens collected by Beeby in 1890, which must be regarded as syntypes or isosyntypes, and the illustrations which accompany Fryer's description. As specimens are to be preferred to illustrations, I have selected the Beeby specimen in **SLBI** as lectotype and cited it above.

*POTAMOGETON SALIGNUS* Fryer in Hiern, *Victoria Hist. Devon.*, 1: 129 (1906).

Type: In the Wye, Carey, Herefordshire, 3 June and 6 July 1893. A. Ley, A. Fryer 2674 (lectotype: **BM!**). Determined as *Potamogeton* × *decipiens* Nolte ex Koch by J. E. Dandy & G. Taylor, 1938.

The circumstances surrounding the description of *Potamogeton salignus* have been clearly set out by Dandy & Taylor (1939b), and need not be repeated here. Dandy and Taylor lectotypify this name by one of the specimens in Fryer's herbarium (**BM**) collected at Carey on the Wye in 1893 by the Rev. A. Ley. None of the specimens now at **BM** is formally labelled as a lectotype, but one bears a pencil note in Dandy's handwriting "lectotype *P. salignus*?". It does not seem possible to decide whether this was the plant originally selected by Dandy and Taylor, or whether the original lectotype was destroyed in the war and Dandy was considering this sheet as a replacement. In any event, Dandy's annotation makes it the most appropriate lectotype of *P. salignus* and I have labelled it accordingly. As Dandy & Taylor (1939b) explain, the Wye plant is taxonomically identical to *P. × salicifolius* (*P. × decipiens*) and they determined the lectotype as such.

*POTAMOGETON UNDULATUS* Wulf. var. *COOPERI* Fryer in *J. Bot., Lond.*, 29: 289 (1891).

*P. × cooperi* (Fryer) Fryer in *Rep. botl. Soc. Exch. Club Br. Isl.*, 1: 497 (1897).

Type: The Leicester Canal, Loughborough, E. F. Cooper. Collected as fresh material by Cooper and pressed by Fryer on 23 August 1891 as Fryer 2032 (lectotype: **BM!**). Determined as *Potamogeton* × *cooperi* (Fryer) Fryer by J. E. Dandy & G. Taylor, 1937.

*Potamogeton undulatus* var. *cooperi* was described by Fryer (1891) as a hybrid between *P. crispus* and *P. perfoliatus*. He ranked it as a variety of *P. undulatus* Wulf. as he then regarded Wolfgang's plant as a hybrid with the same parentage, although differing from the English plant "in some slight degree". Subsequent investigations by J. Baagöe and C. Raunkiaer showed that *P. undulatus* was in fact the hybrid *P. crispus* × *praelongus*, and on being informed of this Fryer raised his plant to specific rank (Fryer 1897, 1900a).

E. F. Cooper first found *P. × cooperi* in the Leicester Canal at Loughborough in 1885. He initially regarded it as a variant of *P. perfoliatus*, but Fryer recognized that it was *P. perfoliatus* × *crispus* when he was shown the material (Cooper 1894). By the time that he described var. *cooperi*, Fryer had received fresh material collected by Cooper at Loughborough and by C. R. Billups in the R. Dee



near Chester. He cultivated both plants, and thus proved "their absolute specific identity". A plate based on fresh specimens from Loughborough illustrated the description.

There are numerous specimens collected by Cooper in Fryer's herbarium, including plants cultivated by Fryer. The specimen cited as lectotype above was labelled by Fryer "The type specimen described in Journal of Botany". It is not actually designated as the lectotype in the Dandy Index, but a label identifying it as the "Type Specimen" dates from the period when Dandy and Taylor were studying the genus. It is the obvious choice of lectotype.

E. F. Cooper was not the first botanist to collect the hybrid *P. crispus* × *P. perfoliatus*. Between 1878 and 1884 it was gathered in five vice-counties. In four of these (v.cc. 40, 55, 57, H39) the plants were named *P. perfoliatus* or, more rarely, *P. crispus* and their hybrid nature was not recognized. However, a specimen collected near Wetherby (v.c. 64) by J. Jackson in 1881 was described as *P. perfoliatus* var. *jacksonii* F. A. Lees in *Rep. bot. Rec. Club*, 1880: 150 (1882). Lees was uncertain of the identity of this plant, but Fryer recognized its similarity to *P. undulatus* var. *cooperi*, regarding it as another variety, *P. undulatus* var. *jacksonii* (F. A. Lees) Fryer in *J. Bot., Lond.*, 29: 291 (1891). He later recognized that the plants were not distinct even at varietal level, and included both under *P. × cooperi* (Fryer 1900a).

*Potamogeton* × *cooperi* remains the correct name for the hybrid of *P. crispus* and *P. perfoliatus* (Dandy 1975). It is relatively widespread in the British Isles (Perring & Sell 1968).

*POTAMOGETON VARIANS* Morong ex Fryer in *J. Bot., Lond.*, 25: 308 (1887).

Type: Witcham Meadlands Drove, Mepal, Cambridgeshire, 1 September 1887. A. Fryer 457 (lectotype: BM!). Determined as *P. gramineus* L. by C. D. Preston, 1986.

During his studies of the Fenland Potamogetons, Fryer came to believe that one plant was identical to an American plant which had been called *P. varians* by the Rev. T. Morong. Morong confirmed this identification, which had initially been suggested by Arthur Bennett. Fryer regarded *P. varians* as a fertile plant closely allied to *P. gramineus*. He (1889a, b) said that it was "the most remarkable *Potamogeton* known to me in its power of resisting extreme drought and heat", and described how it would grow "on the grassy bottoms of ditches as dry as an ordinary meadow".

Morong had never published the name *P. varians*, so it fell to Fryer to validate it. He did this in a paper in which he described the "land-forms" of the Fenland *Potamogeton* species, phenotypes which he had studied in the hot summer of 1887 (Fryer 1887). Only later did he give a detailed description of the plant's submersed as well as its land-form (Fryer 1889b). Both states were illustrated in a plate (tab. 287) which accompanied his next, albeit unrelated, paper (Fryer 1889c).

Fryer's protologue is almost exclusively devoted to a description of the land-form of *P. varians*, with the submersed plant being mentioned only incidentally. A land-form must therefore be selected as lectotype. There are specimens in BM, CGE and MANCH collected by Fryer in 1887 and labelled as "Potamogeton varians Morong. Land-form". One of the specimens at BM is annotated by Fryer: "In a perfectly dry ditch, from which the herbage had been cut, growing unshaded and exposed to the blown ashes of a 'burning ground' ". This wording corresponds closely with the passage in the protologue: "I have gathered healthy plants of *P. varians* (on the bottom of a perfectly dry ditch exposed to the full rays of the sun) the leaves of which were covered with dust and ashes blown from an adjacent 'burning-ground', and yet the lower leaves were as thin and translucent as those of *P. plantagineus*." The plants on this sheet closely match Fryer's description of the land-form of *P. varians*. The fact that they were collected at Witcham Meadlands Drove is appropriate, as another specimen from this locality (Fryer 417, CGE!) bears the note in Fryer's hand "The plant from this locality assented to by Morong, but not quite the original type". I have therefore selected the BM specimen as lectotype and the full details are cited above.

Fryer (1890a, 1892b) came to regard *P. varians* as a hybrid between *P. gramineus* and *P. × zizii*. It is now treated as a synonym of *P. gramineus*. Both the lectotype and also the many specimens of submersed plants subsequently collected by Fryer are referable to this species. The American plant to which Morong originally applied the name *P. varians* is not in fact identical to Fryer's Fenland plant, being a hybrid between *P. gramineus* and the closely related American species *P. illinoensis* Morong (Ogden 1943).

## NOMINA NUDA

*Potamogeton coriaceus* var. *major* Fryer in *J. Bot., Lond.*, **28**: 321 (1890) nom. nud.

*Potamogeton falcatus* var. *major* Fryer in *J. Bot., Lond.*, **32**: 379 (1894) nom. nud.

Each of these names only appears once in Fryer's publications. The specimens labelled *P. coriaceus* var. *major* and *P. falcatus* var. *major* in his herbarium are *P. × zizii* and *P. gramineus* respectively. On a herbarium specimen of *P. coriaceus* var. *major* (MANCH!) Fryer commented "This form is . . . constantly distinct from the type. Fresh specimens have the facies of *P. crassifolius*". The variety of *P. coriaceus* was taken up by Ascherson and Graebner in the combination *P. × zizii* var. *coriaceus* subvar. *major* Fryer ex Ascherson & Graebner in Engler, *Pflanzenr.* IV, 11 (Heft 31): 83 (1907).

## DISCUSSION

In investigating the Fenland Potamogetons, Fryer was particularly concerned with the plants that he included in the '*P. lucens* group', i.e. *P. gramineus*, *P. lucens* and their hybrids. He described several taxa in this group, usually after prolonged field observation and cultivation in his garden. He also applied the names of taxa described by others, such as *P. graminifolius* H. & J. Groves and *P. coriaceus* (Mert. & Koch) A. Benn., to segregates of the *P. lucens* group in Fenland. In doing so he consciously adopted a narrow species concept. Almost all the taxa that he described in this group have now been reduced to synonyms of more widespread and variable species or hybrids. It is perhaps not surprising that it has proved impractical to adopt his very narrow species concept at a national or international level.

The names proposed by Fryer which are still in use are those for the hybrids *P. × bennettii*, *P. × billupsii*, *P. × cooperi* and *P. × lintonii*. Only *P. × billupsii* was described from Fenland. The other three were based on material sent to him from elsewhere, and do not belong to the *P. lucens* group.

## ACKNOWLEDGMENTS

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## NOTES

- 1 In their edition of Babington's *Manual*, the Groves brothers state under *P. flabellatus* Bab. that "a slender maritime form with setaceous [leaves] is var. *scoparius* (Fryer)". Fryer (1888) had discussed *P. scoparius* [Wallr.] in a paper in which he concluded that it was probably a "mere state" of *P. flabellatus*. *P. scoparius* of Wallroth is probably the plant the Groves had in mind, but as they (contrary to their practice elsewhere in the account of *Potamogeton*) do not cite Wallroth as the authority, var. *scoparius* must be treated as a newly described variety. The most appropriate citation appears to be *P. flabellatus* Bab. var. *scoparius* Fryer ex H. & J. Groves in Babington, *Man. Brit. bot.*, 9th ed., 443 (1904). I do not, therefore, treat it as a taxon described by Fryer.
- 2 A. Fryer to J. Britten, 13 December 1889. Autograph collection, Botany Department, British Museum (Natural History). I have expanded Fryer's contractions. Words underlined twice by Fryer are reproduced in bold type.
- 3 C. Bailey to G. C. Druce, 24 May 1912. Druce papers, Department of Plant Sciences, University of Oxford, box 29.

- 4 Miss R. Fryer to G. C. Druce, 14 September 1913. Druce papers, box 15.
- 5 Miss R. Fryer to G. C. Druce, 22 September 1913. Druce papers, box 15.
- 6 C. Bailey to G. C. Druce, 24 May 1912, 15 September 1912. Druce papers, box 29.
- 7 The dates of collection given by Fryer (1898a, p. 11) for the plants illustrated on plate 5 should be transposed. The cultivated plant was collected in September 1890; the wild plant in August 1892.
- 8 A. Fryer to G. C. Druce, 1 September 1898, 3 September 1898, 14 September 1898.
- 9 A. Fryer to E. W. Hunnybun, 11 August 1908. Hunnybun letters, Herbarium, Botany School, University of Cambridge.
- 10 C. Bailey to G. C. Druce, 30 December 1912. Druce papers, box 29.

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#### APPENDIX

When C. Bailey received Fryer's herbarium in 1912 he listed the number of specimens of *Potamogeton* and related genera that it contained.<sup>10</sup> He said that "the figures must be regarded as merely approximate. I had not the time to make a more detailed list. . . ." and "The 4 sheets [*sic*; presumably 'species' was intended] marked 0 are doubtless in the herbarium, but I did not come across them". Nevertheless the list not only indicates the size of Fryer's herbarium but gives some idea of the taxa of particular interest to him. I have arranged the species in systematic order (following Dandy 1958, 1980) with the number of specimens and added the current name in square brackets where appropriate.

#### *Potamogeton*

##### Subgen. *Potamogeton* sect. *Potamogeton*

<i>natans</i>		182
<i>polygonifolius</i>		85
<i>coloratus</i>		183
× <i>billupsii</i>		58
* <i>drucei</i>	[ <i>nodosus</i> ]	0
<i>lucens</i>		216
× <i>fluitans</i>		145
<i>crassifolius</i>	[× <i>fluitans</i> ]	311
<i>decipiens</i>	[× <i>salicifolius</i> ]	220
<i>salignus</i>	[× <i>salicifolius</i> ]	0
<i>falcatus</i>	[ <i>gramineus</i> ]	144
<i>fluctuans</i>	[ <i>gramineus</i> ]	27
<i>graminifolius</i>	[ <i>gramineus</i> ]	213
<i>heterophyllus</i>	[ <i>gramineus</i> ]	406
<i>varians</i>	[ <i>gramineus</i> ]	439
† <i>heterophyllus</i> × <i>zizii</i>		25
<i>kirkii</i>	[× <i>sparganifolius</i> ]	7
× <i>zizii</i>		1047
<i>angustifolius</i>	[× <i>zizii</i> ]	19
<i>coriaceus</i>	[× <i>zizii</i> ]	258
× <i>nitens</i>		135
<i>involutus</i>	[× <i>nitens</i> ]	145
<i>alpinus</i>		126
× <i>griffithii</i>		8
<i>praelongus</i>		16
<i>perfoliatus</i>		128

Subgen. <i>Potamogeton</i> sect. <i>Graminifolii</i>		
<i>friesii</i>		65
<i>rutilus</i>		0
<i>obtusifolius</i>		61
<i>sturrockii</i>	[ <i>obtusifolius</i> ]	0
<i>pusillus</i>	[ <i>berchtoldii</i> ]	80
× <i>lanceolatus</i>		10
<i>trichoides</i>		42
<i>zosteraefolius</i>	[ <i>compressus</i> ]	36
<i>acutifolius</i>		12
Subgen. <i>Potamogeton</i> sect. <i>Batrachoseris</i>		
<i>crispus</i>		78
× <i>cooperi</i>		232
× <i>bennettii</i>		24
Subgen. <i>Coleogeton</i>		
<i>filiformis</i>		32
<i>pectinatus</i>		54
<i>flabellatus</i>	[ <i>pectinatus</i> ]	86
<i>scoparius</i>	[ <i>pectinatus</i> ]	48
<i>Groenlandia</i>		
<i>densa</i>		23
<i>Ruppia</i> and <i>Najas</i>		24
TOTAL		5450

\*Bailey presumably missed the specimens of *P. drucei* as they are not labelled as such.

†Some sheets labelled '*heterophyllus* × *zizii*' by Fryer are referable to *P. gramineus*, others to *P. × zizii*.