

NOMENCLATURE

THE STATUS AND TYPIIFICATION OF *PHEGOPTERIS* AND *GYMNOCARPIUM*J. McNeill¹ and Kathleen M. Pryer^{1,2}*Summary*

It is concluded that *Phegopteris* Fée (Thelypteridaceae) is an apparently nomenclaturally superfluous name, because, when published, it included what is now established to be the type of *Gymnocarpium* Newman. Despite this, *Phegopteris* is a legitimate name as it has a legitimate basionym; it must, however, be cited as *Phegopteris* (Presl) Fée. The protologue of the basionym of *Gymnocarpium dryopteris* does not point to any specimen that could serve as type of that name, and hence of *Gymnocarpium* Newman (Athryiaceae). Moreover, there is no eligible specimen in the Linnaean collections in London, Stockholm or Paris. There is, however, a Burser specimen at Uppsala with a Bauhin name that is not cited in any Linnaean work. This specimen was determined by Linnaeus in his catalogue of the Burser herbarium as *Polypodium dryopteris*, the basionym of *G. dryopteris*, and this is designated as the lectotype. This lectotypification preserves existing usage of both the generic and specific names.

In 1851 Newman established the genus *Gymnocarpium* for the purpose of distinguishing some exindusiate, terrestrial ferns from *Polypodium*, in which they had previously been placed. He was concerned only with the British fern flora and the species of *Polypodium* that he segregated into *Gymnocarpium* were *P. dryopteris* L., *P. robertianum* Hoffm. and *P. phegopteris* L. Newman did not designate a type for his new generic name. *Gymnocarpium* was later included in the comprehensive genus *Dryopteris* Adanson by Christensen in *Index Filicum* (1905), and was subsequently ignored, until Ching (1933) revived it with a new circumscription that excluded *G. phegopteris* (L.) Newman, but retained Newman's two other species. Ching designated *G. dryopteris* (L.) Newman as the type of *Gymnocarpium*.

One year after the publication of *Gymnocarpium*, Fée (1852), apparently unaware of Newman's work, published the genus *Phegopteris*, with about 50 species. He included in *Phegopteris* the three species that were assigned to *Gymnocarpium* by Newman, but adopted the heterotypic synonym *Polypodium calcareum* Smith for *P. robertianum*. Fée did not designate a type for *Phegopteris*, although under the heading "Diagnosis" he referred to "tab. xx, A, fig. 1 Pheg. decursivè pinnata, F.," i.e. to his new combination *Phegopteris decursive-pinnata* (van Hall) Fée (: *Polypodium decursive-pinnata* van Hall). This could be held to suggest that he considered this species "typical." Nevertheless the generic name is clearly derived from the epithet of *Polypodium phegopteris* (= *Phegopteris polypodioides* Fée) and Ching (1963, p. 312), the first person known to have lectotypified *Phegopteris*, designated that species as type.

Phegopteris: Legitimate or Illegitimate?

Holtum (1968) drew attention to the fact that Fée (1852) included in *Phegopteris* the three species that Newman (1851) had specified as belonging to *Gymnocarpium*, and took the view that so long as *Gymnocarpium* was typified by *G. dryopteris*, *Phegopteris* would be an illegitimate superfluous name.

Taxonomically, Newman's *Gymnocarpium* is indeed included in its entirety within *Phegopteris* Fée. The one nomenclatural difference is that Fée used *Polypodium calcareum* Smith (1804), a synonym of *P. robertianum* Hoffm. (1796), one of the species names cited by Newman. Newman (1851a), in

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the same issue of the *Phytologist* as that in which he described *Gymnocarpium*, makes it clear that he regards *P. calcareum* as a synonym of *G. robertianum* (Hoffm.) Newman. Both Newman's papers deal only with British ferns, and hence only three species are named as belonging to *Gymnocarpium*; he does, however, state that in addition "there are about thirty exotic species," and so it would appear that *Phegopteris*, as established by Fée, is substantially the same, taxonomically, as Newman's earlier *Gymnocarpium*.

Holtum (1968) proposed to legitimise and hence preserve existing usage of *Phegopteris* by changing the type of *Gymnocarpium* to *G. robertianum*, the species name that Fée did not specifically mention. Holtum's proposal to change the type of *Gymnocarpium* is untenable under ICBN Art. 8.1 (Voss et al., 1983), since Ching's (1933) designation of *G. dryopteris* as lectotype must be followed, a point already established by Morton (1969).

Morton also disagreed with Holtum as to the illegitimacy of *Phegopteris*. He took the view that no type of *Gymnocarpium* existed until Ching's designation of *G. dryopteris* in 1933, and hence that *Phegopteris* did not include, at time of publication, the type of a name that ought to have been adopted, and so was not superfluous under ICBN Art. 63.2. He argued that *Phegopteris* would only be superfluous if Fée had included all the syntypes of *Gymnocarpium*, i.e. if he had specifically cited all the species names that Newman included in *Gymnocarpium*.

In the case of *Phegopteris*, this viewpoint has evident practical advantages, in that existing practice is not disturbed, which is presumably the reason for the acceptance of this position by pteridologists since 1969. It is not evident, however, that this approach is in accordance with the Code. Principle VI establishes that the Rules of Nomenclature are retroactive unless expressly limited; Art. 7.2 states that the type is "that element to which the name of a taxon is *permanently attached*" (our emphasis); and Art. 63.1 states that a name is illegitimate "if the taxon to which it was applied, as circumscribed by its author, included the type of a name which ought to have been adopted . . . under the rules." By Ching's action (Ching, 1933), the type of *Gymnocarpium* is *G. dryopteris* (= *Polypodium dryopteris*), a name included by Fée in *Phegopteris*.

The Code's definition of "nomenclaturally superfluous when published" (Art. 63.1, quoted above), makes it clear that a name is superfluous, if, in the original publication, the type of a name that should have been adopted under present day rules is cited. The question at issue is whether a name always has a type, or, if no holotype is designated, it only acquires one on lectotypification or neotypification. We see no reason why the *permanent attachment* of a type to a name should not go back to the establishment of the name as well as forward indefinitely into the future, and, on this basis, we consider that Fée must be held to have cited the type of *Gymnocarpium* in his publication of *Phegopteris*.

An example which highlights the problems of any other approach is provided by *Elymus* L. (1753), *Leymus* Hochst. (1848), and *Clinelymus* (Griseb.) Nevski (1932), this last based on *Elymus* Sect. *Clinelymus* Griseb. (1852). The type of *Leymus* is *L. arenarius* (L.) Hochst. (= *Elymus arenarius* L.), the one species included in the genus by Hochstetter. Nevski (1932) can be regarded as having lectotypified the name *Clinelymus* by *E. sibiricus* L.³ The problem arises from the typification of *Elymus*. Britton and Brown (1913) listed *E. arenarius* L. as type but this is superseded by Hitchcock and Green's (1929) choice of *E. sibiricus* (cf. ICBN Art. 8 Ex. 1).

There are two viewpoints: one is that *Elymus* had no type until 1913, presumably had *E. arenarius* as type from 1913 to 1929, and since then has had *E. sibiricus* as type. Alternatively, if the now accepted lectotypification by Hitchcock and Green is retroactive, *Elymus* will be considered typified since 1753 by *E. sibiricus*.

Under the first presumption, the situation is complex, in that the status of the names changes with time (Table 1). *Leymus* is legitimate so long as *Elymus* is not considered to have a type, presumably becomes illegitimate in 1913, and legitimate again in 1929. As the original status is restored, this change is perhaps academic, but the situation with Sect. *Clinelymus* certainly is not. If *Elymus* is considered to be without a type in 1852, Sect. *Clinelymus* would be legitimate when published. It would remain so until 1929, the date of lectotypification of *Elymus* by *E. sibiricus*, a name included by Grisebach in Sect. *Clinelymus*, when it would be rendered not only illegitimate but also invalid,

³ The minimal criteria for lectotypification are debatable (Greuter and Voss, 1982: 37–39), but Nevski's (1932) assignment of only one of Grisebach's four original species (*E. sibiricus* L.) to his Sect. *Euclinelymus*, his exclusion of another from the genus, and his disposition of the remaining two to his Sect. *Turczaninovia*, is being considered, for the purposes of this discussion, effective lectotypification of *Clinelymus* by *C. sibiricus* (L.) Nevski.

Table 1. Status of *Elymus* and some of its segregates, depending on whether or not lectotypification is retroactive.

	1753 (<i>Elymus</i> publ.)	1848 (<i>Leymus</i> publ.) (T: <i>E. arenarius</i>)	1852 (Sect. <i>Clinelymus</i> publ.)	1913 (<i>Elymus</i> LT; <i>E. arenarius</i>)	1929 (<i>Elymus</i> LT; <i>E. sibiricus</i>)	1932 (Sect. <i>Clinelymus</i> LT: <i>E. sibiricus</i>) (<i>Clinelymus</i> publ.)
I. No retroactivity of lectotypification:						
<i>Elymus</i>	Legitimate: no type (? inapplicable)			Legitimate (= <i>Leymus</i>)	Legitimate (= <i>Clinelymus</i>)	Legitimate (= <i>Clinelymus</i>)
<i>Leymus</i>		Legitimate T: <i>E. arenarius</i>		Illegitimate (= <i>Elymus</i>)	Legitimate →	
E. Sect. <i>Clinelymus</i>			Legitimate: no type		Invalid (= <i>Elymus</i> Sect. <i>Elymus</i>)	
<i>Clinelymus</i>						Illegitimate (= <i>Elymus</i>)
II. With retroactivity of lectotypification:						
<i>Elymus</i>	Legitimate: LT: <i>E. sibiricus</i> →					(= <i>Clinelymus</i>)
<i>Leymus</i>		Legitimate T: <i>E. arenarius</i> →				
E. Sect. <i>Clinelymus</i>			Invalid (= <i>Elymus</i> Sect. <i>Elymus</i>) →			
<i>Clinelymus</i>			LT: <i>E. sibiricus</i>			Illegitimate (= <i>Elymus</i>)

because it does not have the form specified by the autonym rule, i.e. it should be Sect. *Elymus* (Arts. 22.1 and 32.1).

Under the alternative viewpoint that lectotypification is retroactive, the position is very much simpler. *Leymus* is and always has been a legitimate name applicable to a genus segregated from *Elymus* and including *E. arenarius*. It is in this sense that it is currently used (e.g. by Tsvelev, 1976 and Melderis, 1980). *Elymus* Sect. *Clinelymus* Griseb. is an invalid name under Arts. 22.1 and 32.1, so that *Clinelymus* must be attributed solely to Nevski and is an illegitimate superfluous name under Art. 63.

One of the arguments used against retroactivity of lectotypification, that it can cause changes in the status of a name, is thus seen to be fallacious. It is lack of retroactivity that causes changes in status: in the case of Sect. *Clinelymus* from legitimacy to invalidity. With retroactivity the status of the names never changes: Sect. *Clinelymus* always has been invalid, even though this was only made explicit in 1929.

Does the inclusion, then, of the type of *Gymnocarpium* make *Phegopteris* illegitimate? Fortunately not. The provisions of ICBN Art. 63.3 establish that a name that would otherwise be superfluous is not illegitimate if its basionym is legitimate. Although the authorship is usually given merely as *Phegopteris* Fée, Fée in fact based his name on the infrageneric taxon of unspecified rank, *Polypodium* § 2 *Phegopteris* Presl, Tent. Filic. 179 (1836). Under ICBN Art. 35.2 this is a legitimate name, even although rankless; hence the generic name *Phegopteris*, though incorrect when published by Fée, is not illegitimate, and when lectotypified by *P. polypodioides* Fée (= *Polypodium phegopteris* L.) (Ching, 1963), can correctly be applied in its current usage that excludes the type of *Gymnocarpium*.

The name should, however, be cited as *Phegopteris* (Presl) Fée and not as *Phegopteris* Fée as has been past usage.

Typification of *Gymnocarpium*

As noted above, Holttum's (1968) proposal to change Ching's (1933) lectotypification from *G. dryopteris* to *G. robertianum* is untenable under ICBN Art. 8. As a result of the decisions of the Sydney Congress in 1981, however, the precise type of *Gymnocarpium* becomes that of *G. dryopteris*, i.e. of *Polypodium dryopteris* L. The typification of this last name, and hence of *Gymnocarpium*, presents problems.

In the original publication of *Polypodium dryopteris*, Linnaeus (*Sp. Pl.* 1093. 1753), gives the phrase-name: "POLYPODIUM fronde supradecomposita: foliolis ternis bipinnatis. *Fl. suec.* 852. *Dalib. paris.* 314," the attributions being to his own *Flora suecica* (1745) and to Dalibard's *Flora parisiensis Prodrromus* (1749). Linnaeus also cites three synonyms, one to his *Flora lapponica* (1737), one to Bauhin's *Pinax* (1671), and one to Clusius's *Rariorum plantarum historia* (1601). The "Habitat" is given as "in Europae nemoribus."

The Dalibard reference merely cites *Flora suecica* for the phrase-name adopted and the *Flora lapponica* and *Pinax* synonyms, and need not be considered further.

The *Flora suecica* entry is almost identical to that in *Species plantarum* except for an additional synonym "Dryopteris Dill. giss. 103" referring to Dillenius's *Catalogus plantarum circa Gissam sponte nascentium* (1718)—see discussion below. The "Habitat" given in *Flora suecica* is equally general: "Passim in sylvis & nemoribus."

It is evident that Linnaeus established his concept of *P. dryopteris* at the time of preparing *Flora suecica* but no specimens exist in the Linnaean herbarium in London (LINN) and none is known that could have been in his possession in 1745 (or 1753). The only Linnaean specimen known to exist under the name *Polypodium dryopteris* is at Stockholm (S 415 19). It is from Herb. Alstroemer, has no annotation by Linnaeus and was presumably received from Linnaeus *filius* around 1783. Although referable to the species to which the epithet *dryopteris* is applied, from its apparent date etc., it is not eligible for consideration as type material.

W. T. Stearn (Jarvis *in litt.*) is of the opinion that Linnaeus probably kept his Swedish herbarium separate from his main collections and that it was either lost or destroyed. This view certainly accords with the situation with *Polypodium dryopteris* and it would seem, therefore, that we are left with the cited synonyms as potential sources of a type.

The first is that from *Flora lapponica*; the phrase-name given is *Polypodium trifidum, ramis pinnatis, pinnis pinnatifidis*, which, like that in *Flora suecica*, emphasises the ternate arrangement of the two basal pinnae and the rest of the frond, characteristic of the species that we know today as *G. dryopteris*. Moreover, neither phrase-name shows any conflict with the features of this species. The occurrence of the species is given as "In monte Kiurivari prope venam plumbiferam & alibi." The specific location

was visited by Linnaeus on July 3, 1732 and is said by him (Smith, 1811) to be half a mile from “Kiomitis,” apparently Tjåmotis (66°56'N 18°30'E) between Jokkmokk and Kvikkjokk in the Norrbotten province of northern Sweden. A small *Flora lapponica* herbarium exists in Paris (Fries, 1861; Alston, 1957), but no cryptogams are included amongst the specimens in this collection.

The remainder of the entry in *Flora lapponica* is essentially the same as that in *Flora suecica* except that Clusius's earlier publication *Rariorum aliquot Stirpium per Pannoniam, Austriae . . .* (1583) is cited (“Clus pan. 704.”) instead of the *Historia*.

The second synonym and one which might be expected to yield a potential lectotype specimen is “*Filix ramosa minor, pinnulis dentatis. Bauh. pin. 358.*” Specimens in the Burser herbarium named according to Bauhin's *Pinax* were regularly consulted by Linnaeus and can often be taken as representing his understanding of the Bauhin phrase-name (Stearn, 1957: 116–118). There is indeed a specimen in the Burser herbarium at Uppsala with this phrase-name. It is volume XX number 27 (Juel, 1936), but it is labelled “An *Filix ramosa minor pinnulis dentatis Bauh?*” and this expression of doubt is justified because the specimen has two well-developed fronds, both of which have pinnae becoming progressively smaller from the base to the apex and not at all “ternate” as emphasised in the Linnaean phrase-name. The specimen is, as noted by Juel, a member of the *Dryopteris spinulosa* Watt (*D. carthusiana* (Villars) H. P. Fuchs) complex.

Although Linnaeus did enter the determination of this species in his copy of the 1671 edition of the *Pinax* (Savage, 1937; cf. Stearn, 1957, p. 116) and included it, but with a “?”, in his manuscript catalogue of determinations of specimens in the Burser herbarium, Savage (1937) has a footnote that the specific name (*Polypodium dryopteris*) may have been crossed out by Linnaeus. Given these two further elements of doubt and the fact that this specimen fails so evidently to match the diagnosis of *Polypodium dryopteris*, we take the view that it cannot be considered part of the “original material” (ICBN Art. 7.5) from which a lectotype may be chosen.

The third and last *Species plantarum* synonym is that of Clusius, “*Filix pumila saxatilis*” in *Species plantarum* and *Flora suecica*, but more specifically “*Filix pumila saxatilis* I.” in *Flora lapponica*. Clusius illustrates as “I.” (*Filix pumila mas*) and “II.” (*Filix pumila femina*) what he believes to be male and female plants of the same species. In his *Historia* (1601) Clusius copies the woodcuts and text that he had previously published in 1583 (see above) and so there is no significance in the change in Linnaeus's synonym citation between *Flora lapponica* and his later works. The reproduction of the plates is better in *Rariorum . . . Stirpium . . . Pannoniam . . .* but otherwise, for our purpose, the two works need not be distinguished.

Clusius has two woodcuts, one of what he considered to be the male and one the female and a fairly detailed discussion of the characteristics of the taxon. He reports the first, i.e. the “male” to which Linnaeus was referring in *Flora lapponica*, as occurring “copiosissime . . . in saxis non modo ad Gamingam & Neuberg, sed ad omnium fere montium radices.” The two specific localities are Gaming, Nieder Osterreich (47°56'N 15°06'E) and Neuberg in Steiermark (47°40'N 15°35'E), both in the foothills of the Austrian alps. The two drawings are clearly of different species, that of II, (“femina”) being almost certainly *Woodsia ilvensis* (L.) R. Br. Number I, that concerns us, is more difficult to identify with confidence. The illustration shows a rhizome with three fronds, one of which is immature. None clearly matches Linnaeus's diagnostic phrase “*foliolis ternis*,” although the frond on the right has relatively large basal pinnae, but it is scarcely ternate. The species illustrated is definitely not *Gymnocarpium dryopteris* as that name is currently applied, but it might well be *G. robertianum*, which also occurs in the area mentioned. This was in fact the identification of the plate made by J. E. Smith (1804) when he described *Polypodium calcareum*, now regarded as a synonym of *G. robertianum* (Pryer et al., in press). Both plates are of high quality with evidence of care in the indication of venation and of sori arrangement. That of *Filix pumila saxatilis* I (mas) is interesting in that the rachis does not have the straight clear lines of, for example, II (femina) but, instead, there is a suggestion that the glandular hairs on the rachis, which help to distinguish *G. robertianum* from *G. dryopteris*, have been incorporated in the drawing.

The only remaining synonym in *Flora suecica*, and not one included in the *Species plantarum* account, is that of “*Dryopteris* Dill.” It merely cites several species names, of which the Bauhin synonym already discussed appears first. There is no original descriptive material and the further synonyms, mostly to other Bauhin taxa, are too remote from Linnaeus's publication of *Polypodium dryopteris* to be relevant for purposes of typification.

The conclusion that we come to from this consideration of the protologue of *Polypodium dryopteris* is that neither the Burser specimen (XX.27 at UPS) implied by the Bauhin synonym, nor the Clusius



Fig. 1. *Burser* specimen XX.32 (UPS), lectotype of *Polypodium dryopteris* L. (= *Gymnocarpium dryopteris* (L.) Newman) and hence of *Gymnocarpium* Newman.

plate (in *Rariorum . . . Stirpium . . . Pannoniam . . .* 704, 1583, and *Rariorum plantarum historia* 2: 212, 1601), match the original diagnosis. The Burser specimen is certainly “in serious conflict” with this portion of the protologue and given the doubt as to Linnaeus’s interpretation of it, it should not be considered further as a possible lectotype. The conflict between the Clusius plate and the protologue is less serious, but it certainly does not match the diagnosis as do specimens of the species to which the name *G. dryopteris* is currently applied.

At first sight the only means of fixing application of *Polypodium dryopteris* would seem to be by neotypification or by lectotypifying on the Linnaean diagnosis. Moreover, the former approach would only be permissible if it was agreed that the Burser specimen (XX.27) did not form part of the original material, and, more questionably, if the word “material” in the Code is taken to mean “herbarium material.” There is some support for this position in the Guide for the Determination of Types (ICBN—T.5) where it says “originally cited material or material seen by the author but not cited, and its duplicates . . .” (our emphasis), but most taxonomists, including ourselves, probably take the view that, although a validating description or diagnosis is not “original material,” a cited plate probably must be so regarded.

There is, however, good evidence that another specimen was seen by Linnaeus, even although he provides no indication of this in the protologue of *Polypodium dryopteris*. This is a specimen in the Burser herbarium, XX.32, labelled “Filix querna Bauh. Filix arborea Tragi”; the first of these names is not apparently cited by Linnaeus in any of his works, whereas the second, as used by Lobel, is considered a synonym of *Acrostichum septentrionale* (= *Asplenium septentrionale*) (Richter, 1840). In his manuscript catalogue of determinations of the specimens in the Burser herbarium (Savage, 1937), however, Linnaeus unequivocally identifies this specimen as *Polypodium dryopteris*. He appears to have misread the Bauhin name, because he lists this as *Filix quercina* rather than *Filix querna*. Perhaps it was because of this confusion that Linnaeus failed to cite *Filix querna* (or *Filix quercina*) in *Species plantarum*. In any event, the specimen (Fig. 1) is unmistakably of the species to which the name *Gymnocarpium dryopteris* is currently applied. Accordingly, we designate it as lectotype of that name and thus also of *Gymnocarpium*.

The full label data on the specimen is as follows:

Filix querna Bauh.
Filix arborea Tragi
Eichelfarn. Baumfarn.
In Lusatia, Bohemia, Dania.

This lectotypification preserves the current usage of both the generic name *Gymnocarpium* and that of *G. dryopteris*.

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