THE TYPIFICATION OF FUCUS CARTILAGINEUS L. AND F. CORNEUS HUDS.

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The following notes refer to the typification of the two oldest species names applied in the genus *Gelidium*, including also comments on other related topics. *Gelidium* is probably the most confused genus, both nomenclaturally and taxonomically, of the *Rhodophyta*. This investigation began in an attempt to determine the correct names to be applied to the British species of the genus, but it was soon discovered that a much wider geographical consideration was necessary. I would like to take this opportunity to pay tribute to the help and assistance which has been afforded by Dr. J. Th. Koster in this and other investigations, over a period of many years.

Extreme ecological and seasonal polymorphism are the principal causes of the present situation in the genus *Gelidium*. Extensive fieldwork over the past seventeen years has given some indication of the limits of taxa (Dixon, 1958, 1966), in so far as the European representatives are concerned. The nomenclatural problems are, however, still largely untouched. The purpose of the present paper is to examine critically the typification of the two oldest epithets referred to the genus *Gelidium*. These are:

1. *cartilagineum*, based on *Fucus cartilagineus* Linnaeus (1753),
2. *corneum*, based on *Fucus corneus* Hudson (1762).

Over the past two hundred years there have been many discussions and different interpretations of *Fucus corneus* Huds., whereas the identity of the *F. cartilagineus* L. appears to have been accepted almost without question. What began as a routine attempt to typify the latter species soon disclosed that the currently-accepted interpretation is incorrect.

The original treatment of *Fucus cartilagineus* by Linnaeus (1753) is as follows:

'20. Fucus cartilagineus, caule teretiusculo compresso; frondibus supra- decompositis pinnatis: linearibus coloratis. *Roy. lugdb.* 515. *Guett. stamp.* 2. p. 404.
Fucoides rubens varie dissectum. *Raj. angl.* 8. p. 37.
Muscus marinus tenuissime dissectus ruber. *Bauh. pin.* 363. cartilagineus

Habitat in Oceano *australiore.*'

As can be seen, this original treatment is based on several elements. The phrase-name (*sensu* Stearn, 1957) is cited in such a way as to indicate its direct origin from the earlier treatment in Van Royen (1740), although there is a very slight grammatical correction, 'supradecomposito-pinnatis' in the latter being changed to 'supradecompositis pinnatis'. Linnaeus accepted the phrase-names published in Van Royen because he had assisted

himself in their preparation, as was the case with *Fucus rubens* L. (Dixon, 1964). The citation of Guettard (1747) following the phrase name is a reference to a direct repetition of the Van Royen treatment. The first synonym is taken from Ray (1724), '8' being presumably a typographic error for '3', with the second synonym from Bauhin (1623). Finally, the statement of distribution indicates that the species is from the 'southern seas'. As Stearn (1957) has indicated, typification of such a species as *Fucus cartilagineus*, based on several elements, must take into consideration all the evidence available, but the most important is the source of the Linnaean phrase-name. Each of the elements involved in the initial treatment of *F. cartilagineus* will be considered in relation to the alga or algae involved and the geographical area from which the material was collected.

As has been indicated, the phrase-name of the Linnaean treatment is taken from Van Royen. The Rijksherbarium, Leiden, now contains three specimens relevant to the topic under discussion which were once in the Van Royen herbarium. One of these specimens (Herb. Lugdb. Bat. 910.184.14) is annotated in Adrian Van Royen's hand with the phrase-name as published in the '*Florae Leydensis Prodromus*'. The other two specimens (Herb. Lugd. Bat. 910.155.2305 and 910.168.55) are annotated in the hand of David Van Royen, nephew of Adrian, with the 'corrected' phrase-name of the '*Species Plantarum*' and a reference to the latter, but with no mention of the previous Van Royen treatment. The specimen annotated by Adrian van Royen is the original specimen on which the phrase-name published by him (Van Royen, 1740) was based. The two other specimens are presumably acquired at a later date by David Van Royen, who succeeded his uncle as Director of the Leiden Botanic Garden in 1754, and who corresponded extensively with Linnaeus (see Veendorp & Baas-Becking, 1937). The latter are specimens of the alga now known as *Gelidium cartilagineum*, but the original specimen on which the Van Royen treatment is based must be referred to the genus *Plocamium*. The country of origin of the alga described by Van Royen is not mentioned, but from the general notes in the introduction to the flora it is obvious that both Dutch and exotic species are treated in the work. Taking next the citation of Guettard (1747) by Linnaeus, it should be appreciated that this author does nothing but take the Van Royen treatment and add to it a detailed discussion of the occurrence of the species in France. Localities from both the Channel and Atlantic coasts are mentioned in detail, but with no reference whatsoever to any extra-European distribution. The Ray (1724) synonym, cited in the Linnaean treatment of *Fucus cartilagineus*, is now virtually impossible to typify in that it is based on a very large number of earlier accounts and for none of these is it possible to locate the specimens involved at the present time. Ray does refer to three figures, published by Plukenet (1696), Parkinson (1640), and Clusius (1601), stating that the latter is the best representation of the plant under discussion. The illustrations are all somewhat stylized but they may refer to the alga now known as *Heterosiphonia plumosa*. Turner (1802) has shown that Ray (1686) himself distinguished in an earlier publication between the algae known subsequently as *Plocamium* and *Heterosiphonia* and that the confusion arose in the third edition of Ray (1724) edited anonymously and posthumously by Dillenius. The material now in the Ray/Dillenius herbarium is of little help in this matter. The three specimens present were collected at Llanfaethly (Anglesey, North Wales) by W. Jones; neither this locality nor this collector are mentioned in the text. The three specimens were referred by Batters (in Druce & Vines, 1907) to *Plocamium coccineum*, *Sphaerococcus coronopifolius*, and *Delesseria* (= *Membranoptera*) *alata* respectively, and subsequent examination confirms these determinations. The most important fact to be obtained from the Ray treatment is that the localities cited are all from the east and south coasts of England, with no mention

of any extra-European distribution. The second synonym in Linnaeus (1753), quoted from Bauhin (1623), also cannot be typified at the present time. It is unfortunate that there are no specimens referred to this entity in the Burser herbarium (cf. Juel, 1936) which was named and arranged in accordance with Bauhin's text and much used by Linnaeus as a guide to the latter (Savage, 1937).

Of the evidence available, the most important, namely the Linnaean phrase-name has been shown to be taken from Van Royen and that the specimen on which the latter was based is now referable to the genus *Plocamium*. Secondly, the geographical data indicate that somehow Linnaeus confused localities in that it is difficult to see why *Fucus cartilagineus* should be regarded as a species of the southern seas when every locality listed in the works cited by Linnaeus is from northern Europe. Thus, it would appear that a northern species was intended originally, not the African species of *Gelidium* to which the name became attached subsequently.

Linnaeus himself changed his interpretation over the years, as can be seen in the successive Linnaean publications. In the '*Mantissa*' (Linnaeus, 1771), *Fucus versicolor* of Gmelin (1768) is first cited as a synonym of *F. cartilagineus* whilst in the 12th and 13th editions of the '*Systema naturae*' (Linnaeus, 1767, 1774) a reference to the illustration of Seba (1740) is added. Both the Gmelin and Seba illustrations are indubitably of the southern hemisphere species of *Gelidium*. That Linneaus had changed his mind was appreciated by several of the early authors. Burmann (1768), for instance, differentiated between *Fucus cartilagineus* L. and his own species of the same name, the latter being based on the Seba illustration. The most detailed study of *Fucus cartilagineus* L. was undertaken by Dawson Turner (1802) who came to the conclusion that there had been a definite change in attribution of the binomial. Turner was influenced by the material preserved in the Linnaean herbarium and concluded that the species from south Africa, currently known as *Gelidium cartilagineum*, 'does not seem to be the plant originally designed [*sic*] in the *Species Plantarum* under the name of *F. cartilagineus*, although the references in the Mantissa to Gmelin's *versicolor* and in the Systema to Seba, render it more probable that it is what was really intended in the latter work'. Ultimately, Turner (1809) turned to the generally-accepted, later, Linnaean interpretation. The usage of the Van Royen phrase-name indicates that no specimens were available to Linnaeus at the time of writing the '*Species plantarum*' so that any material in his herbarium must represent a later addition. Although not strictly relevant to the typification of *Fucus cartilagineus*, the argument used by Turner indicates that a brief consideration of the Linnaean collections is warranted. The specimens now preserved therein, relevant to the present discussion, are as follows: —

1. 1274/96: labelled '20 *cartilagineus*' in Linnaeus's hand. The material on this sheet is representative of the European alga now known either as *Gelidium corneum* or *G. latifolium*.

2. 1274/97: labelled '*cartilagineus*' in Linnaeus's hand, the specimens here are of the south African alga, known currently as *Gelidium cartilagineum*.

3. 1274/98, 1274/99, 1274/100: three sheets, all without labels, attached to 1274/97 with a pin, and with specimens of the same species as on that sheet.

4. 1274/67: labelled '*cartilagineus*' with this deleted and replaced by '*ciliatus*', both inscriptions being in Linneaus's hand, bearing specimens of the same alga as on 1274/96, referable either to *Gelidium corneum* or *G. latifolium*.

The various identifications are such that one must assume a considerable degree of uncertainty on the part of Linneaus as to the application of the name. It is to be regretted that the questions raised by Burmann and Turner were never satisfactorily answered. It is very probable that the subsequent independent descriptions of algae under the name *Fucus cartilagineus*, and the resulting confusions relating to geographical distribution which then ensued, were the principal reason for the fundamental question, i.e., the identity of *F. cartilagineus* L. becoming lost.

The immediate nomenclatural problem is that the binomial *Fucus cartilagineus* must be applied to the European species of *Plocamium* and not to the south African species of *Gelidium* with which it has been associated. The genus *Plocamium* was created by Lamouroux (1813), the species transferred in the original treatment representing a very heterogeneous assemblage by modern standards. The name of the genus was taken from the specific epithet of *Fucus plocamium* of Gmelin (1768), Lamouroux substituting *vulgare* as the specific epithet to avoid a tautonym. Subsequently, Lyngbye (1819) took up the earlier epithet *coccineus*, derived from *Fucus coccineus* Hudson (1778), and it is as *Plocamium coccineum* that the species has been known generally. *Fucus coccineus* is, however, an illegitimate and superfluous name and in recent years the correct binomial for the species has been accepted as *Plocamium vulgare*. The present study shows that *Fucus cartilagineus* L. provides the oldest epithet available for the species of *Plocamium* of the northern hemisphere.

Plocamium cartilagineum (L.) Dixon, *comb. nov.* = *Fucus cartilagineus* L., Spec. pl. 2 (1753) 1161.

Turning now to the south African species of *Gelidium*, the oldest binomial associated indisputably with this species is *Fucus cartilagineus* Burmann (1768) which, as has been shown, was based upon the Seba (1740) illustration. This is, however, a later homonym of *F. cartilagineus* L. Gmelin (1768), only a few days after Burmann (see Dixon, 1962) published descriptions of two species, *F. capensis* and *F. versicolor*, both of which are referable to the taxon under discussion. Of these two, the latter has already been transferred formally to *Gelidium* by Lamouroux (1813) so that the correct name for the southern species of *Gelidium* is *G. versicolor* (Gmel.) Lamour. The location of the original material used by Gmelin is in doubt. In recent years specimens of this author have been detected in both the Leningrad and Moscow herbaria (Zinova, private communication), but to date nothing is known of the type material of *Fucus versicolor*. However, the illustration (Gmelin, 1768, plate 17 fig. 2) is sufficiently clear to serve as the type of the species.

As stated previously, confusion regarding *Fucus cartilagineus* L. developed by various further misidentifications and by the independent description of other algae under the same binomial. Taking the latter first, these independent descriptions are: —

1. *Fucus cartilagineus* Burmann (1768). As stated previously, this binomial is to be typified by the Seba (1740) illustration of the south African species of *Gelidium* for which the correct name has been shown to be *G. versicolor*.

2. *Fucus cartilagineus* Hudson (1762). It does not appear to have been appreciated that Hudson described a species under this binomial independently of that described earlier by Linnaeus, although Turner (1802) does comment on this matter. The species description given by Hudson appears to be based entirely on the alga described by Ray (1724) as *Fucoides rubens varie dissectum*. As has been shown previously, this alga cannot now be

typified accurately although the comments of Ray indicate that the closest approximation is probably the alga known today as *Heterosiphonia plumosa*. Subsequently, Hudson changed his interpretation considerably, as happened with so many of his algae (cf. Dixon, 1963). In the second edition of the '*Flora anglica*' Hudson (1778) accepted the previous Linnaean application of *Fucus cartilagineus* with the species description taken directly from the 12th edition of the '*Systema naturae*', (Linnaeus, 1767) and with *Fucus versicolor* Gmel. cited as a synonym. In addition, though, Hudson also quotes the *Fucus coronopi facie* of Ray (1724) and makes a reference to a specimen in the Buddle herbarium. As the Ray description is also based directly and completely on the Buddle material this Ray taxon must be typified by that material which is referable to the alga known today as *Sphaerococcus coronopifolius*. In this connection it is interesting to note that there are at the present time three specimens in the British Museum (Natural History) received from the Hugh Davies collection annotated in Davies's hand '*Fucus cartilagineus*. These are particularly worth preserving, as named by Mr. Hudson himself' as well as another sheet which once was in the possession of Hudson and formed part of the material sold after his death (cf. Dixon, 1959). These specimens are all of the alga known currently as *Sphaerococcus coronopifolius*. These identifications are, however, an indication of the later application of the binomial, rather than the initial usage, which was clearly different. The species description of *Fucus cartilagineus* given by Hudson in the first edition of the '*Flora anglica*' (Hudson, 1762) was transferred in the second edition (Hudson, 1778) to the newly described *Fucus coccineus*, with which the Ray synonym *Fucoides rubens varie dissectum* is also associated. In addition, reference is made to the picture given by Clusius (1601), which has been discussed, as well as the Gmelin description and figure of *Fucus plocamium*. The quotation of the latter makes *F. coccineus* a superfluous name, but it is not altogether clear to which alga Hudson was referring under this binomial.

3. *Fucus cartilagineus* Forsskål (1775). The description of *Fucus cartilagineus* given by Forsskål (1775) was based on an alga collected 'in freto Oresund', that is, in the Kattegat. As has been shown (Dixon, 1964), *F. cartilagineus* Forsk. is referable to the alga known currently as *Phyllophora crispa*.

In addition to the changed interpretation of *Fucus cartilagineus* L. and the description of other algae independently under the same binomial, the position was further confused by gross misidentifications. These were particularly critical in relation to the geographical distribution of the south African alga. Gunnerus (1772), for instance, figured under the name *Fucus cartilagineus* a specimen which is indubitably of the south African species of *Gelidium*, although he claimed that it had been collected in northern Norway. This has been the cause of much comment (Turner, 1802, 1809; Harvey, 1851) and it was not for more than a century that Foslie (1886) was able to show that the material so identified in Gunnerus's herbarium was in fact referable to the genus *Ptilota*. It is not at all clear how this substitution took place but from the comments made, Lyngbye (1819, p. 55) was aware of the situation. The British records of the south African species of *Gelidium* were initiated by Stackhouse (1801) and Turner (1802) on the basis of material collected by Withering in the Isle of Wight. Although these specimens have now been located and the identification confirmed (Dixon, 1962), the entity must be rejected from the British flora because of the obviously drift origin of the specimens. The Mediterranean records by Allioni (1775), Scopoli (1760), Wulfen (1789), and Desfontaines (1799) also must be rejected in that they appear to be based on specimens of *Sphaerococcus coronopifolius* although precise re-identification of the material is possible only in the case of the last author (cf. Agardh, 1822).

Turning now to *Gelidium corneum*, this binomial has been applied in many different ways and the 'species' reported from all parts of the world. Even by the beginning of the present century the confusion had become so great that De Toni (1897), in his treatment of *Gelidium*, simply rejected the entity. Setchell (1931), in an effort to clarify the situation, carried out a typification of *Fucus corneus* Huds. He indicated that this taxon must be regarded as having been based on a specimen of the alga now known as *Gelidium sesquipedale* (Clem.) Thur. Feldmann & Hamel (1936) then objected to this decision, arguing that to apply the name *G. corneum* to the latter would simply cause confusion and for this reason rejected the binomial under the article of the 'International Code of Botanical Nomenclature' of the period relating to *nomina ambigua*. This decision has been followed by Boergesen (1938) and in all subsequent major treatments in Europe. It is proposed therefore, in view of the importance of this species, to reconsider briefly the situation with regard to both the typification of *Fucus corneus* Huds. and the grounds for rejection proposed by Feldmann & Hamel.

The original treatment of *Fucus corneus* Hudson (1762) is as follows:

'corneus 38. FUCUS cartilagineus, caule teretiusculo compresso ramosissimo, ramis subpinnatis, laciniis acutis fructiferis.
Fucus flavicans teretifolius, ramulis pennatim enascentibus. *R. Syn.* 50.
Fructibus parvus pennatus flavicans, corneus et tenax. *Buddl. hort. sicc.* II.2.
Anglis, Horny Fucus.
Habitat *in littore* Devoniae *passim*.'

The first synonym is a reference to Ray (1724) whilst the second is a citation of the specimens so named in the Buddle herbarium. Setchell, in his typification, located these specimens and 'the inclination to regard the Buddle specimens as the type of *Fucus corneus* Hudson crystallizes into certainty as the investigation proceeds'. What Setchell does not appear to have done was to follow up the Ray synonym. This is as follows: —

'49. Fucus flavicans teretifolius, ramulis pennatim enascentibus. Fruticulus parvus pennatus flavicans, corneus et tenax *Buddl. H. Sicc. Vol. 1. fol. 2.*'

This is followed by some general notes, including the comment that D. Miller had collected the specimen. As that information could only have been obtained from the inscription on the specimen, the latter must have been examined personally by Ray, or rather, Dillenius, who was responsible for this, the third, posthumous, edition of Ray's work. From the quotation given above, it is clear that the treatment of Ray's species is based completely and exclusively on the same Buddle specimen as that referred to by Hudson, and on no other material. Furthermore, Hudson (1762) stated that he had examined the Buddle herbarium in the course of preparation of the first edition of the '*Flora anglica*'. Thus the Buddle material is quoted twice by Hudson in his original treatment of *Fucus corneus*, first directly and secondly through the Ray reference, and no other specimens or descriptions are mentioned. There is thus no other interpretation possible than that the Buddle specimens must be regarded as the type material of *Fucus corneus* Huds. The Buddle herbarium is preserved as part of the Sloane collection in the British Museum (Natural History) and personal examination confirms the identification made by Setchell. The material is of the alga known currently as *Gelidium sesquipedale*.

The argument raised by Feldmann & Hamel (1936), that the application of the binomial *Gelidium corneum* to the alga known currently as *G. sesquipedale* will cause confusion is of some importance, particularly in relation to the general question of *nomina ambigua*. If typification has not been carried out or is impossible because of the destruction of material,

then there may well be no way of distinguishing between the merits of the various interpretations of the name; in such a case there are obviously sufficient grounds for a name to be rejected. Accurate and careful typification does, however, give a precise indication of the application of a name. If it appears from this that there have been serious errors of interpretation, this is surely no justification for the elimination of the name in question. If this were to become acceptable, it is feasible that the rejection of a name could be secured simply by making a sufficiently large number of incorrect identifications in the major herbaria.

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