Definition of Favourable Conservation Status for Petalwort *Petalophyllum ralfsii*

Defining Favourable Conservation Status Project

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NATURAL ENGLAND

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About the DFCS project

Natural England's Defining Favourable Conservation Status (DFCS) project is defining the minimum threshold for thriving habitats and species in England.

We are doing this so we can say what good looks like, recommend actions to get them there and keep them that way.

Using Natural England's expert evidence and specialist knowledge, our DFCS definitions will set out our aspirations for these species and habitats in England.

We are publishing these tools so that you, our partners and decision-makers can do your bit for nature, better.

As we publish more of our work, the format of our definitions may evolve, however the content will remain largely the same.

This definition has been prepared using current data and evidence. It represents Natural England's view of FCS based on the best available information at the time of production.

All blocks of evidence within the definition should be given one of three confidence levels [High, Moderate, Low], based on the quality of the evidence, its applicability and the level of agreement.

Quality of evidence is defined as follows:

- Robust evidence is that which has been reported in peer-reviewed literature, or other reputable literature, from well-designed experiments, surveys or inventories that shows signs of being applicable generally.
- Medium evidence is that reported from well-designed experiments, surveys or inventories but from only one or a small number of sites, with uncertainty over its more general applicability, or is correlational or circumstantial evidence.
- Limited evidence includes 'expert opinion', based on knowledge of ecological factors that plausibly suggest an effect, but there is no circumstantial or direct evidence available.

Confidence levels are assigned as shown in the following matrix (after IPCC 2010):

High agreement Limited evidence	High agreement Medium evidence	High agreement Robust evidence
Medium agreement Limited evidence	Medium agreement Medium evidence	Medium agreement Robust evidence
Low agreement Limited evidence	Low agreement Medium evidence	Low agreement Robust evidence

Introduction

This document sets out Natural England's view on the contribution England needs to make to achieve Favourable Conservation Status (FCS) for **Petalwort *Petalophyllum ralfsii***. It is the aim of the Habitats Directive to achieve and maintain FCS. The England contribution is defined in terms of the natural range and population of the species and the extent of habitat necessary for long-term maintenance of populations.

This section contains the summary statement of the England contribution. Sections 2 – 5 describe the evidence considered when defining FCS for each of the three parameters. Annex 1 sets out the UK and England position in the 3rd Habitats Directive report.

This document does not include any action planning, or describe actions, to achieve FCS where the species is not considered to be in FCS. These will be presented separately, for example within restoration strategies.

England contribution to FCS

England contribution to FCS is sustainable Petalwort populations in the 10 locations where the species occurs.

- Populations to be maintained, and locally increased to make them less likely to be lost in the face of adverse change where this is appropriate to the natural functioning of dune systems. As a guide, each population should be 1,000 or more individual thalli and numbers should be stable, in the long-term, at least at this level, but detail to be determined based on site-by-site assessment
- Area and quality of suitable dune slack habitat to be maintained, and locally increased within functioning dune systems, to support sustainable populations

Whilst the conservation effort to achieve FCS should ensure the species is of Least Concern (in an IUCN sense), Petalwort is likely to remain Nationally Scarce as its specific ecological requirement for damp, calcareous dune slacks.is met in few places.

Definitions and ecosystem context

Species definition

S1395 Petalwort, Petalophyllum ralfsii

Threat status

Red list status (indicating extinction risk):

- **Global:** Not assessed.
- **Europe:** Candidate species for European Red List
- **Britain:** Vulnerable*

Other statuses

- Bern Convention Appendix 1 species
- EC Habitats Directive Appendix 2 species
- Schedule 8 of the Wildlife & Countryside Act 1981
- Nationally Scarce
- Section 41 NERC Act species

Sources:

Hodgetts, N. G. 2011. A revised Red List of bryophytes in Britain. Field Bryology, 103, 40-49.
Hodgetts, N.G. 2015. Checklist and country status of European bryophytes – towards a new Red List for Europe. Irish Wildlife Manuals, No. 84. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
Hodgetts, N. G. & Callaghan, D. 2017. Revised Red List of Bryophytes in Britain, initial draft report to Natural England
Pescott, O. 2016. Revised lists of Nationally Rare and Scarce bryophytes for Britain. Field Bryology, 115, 22-30.

** British Red List Status updated following the production of the revised bryophytes Red List for Britain in December 2016. This Red List is currently awaiting ratification.*

Habitat for the species definition

The species typically grows in open, damp, calcareous dune slacks, often on low hummocks rather than on very wet ground, on compacted sandy/muddy bryophyte-rich open turf. Most localities are referable to Annex I type **2190 Humid dune slacks**. It has occasionally been recorded in other coastal grassland where conditions are similar.

Closely associated species may include the mosses *Barbula convoluta*, *Bryum* spp., *Didymodon tophaceus*, *Ditrichum flexicaule* (*sensu lato*), *Hypnum lacunosum*, glaucous sedge *Carex flacca*, the grasses common bent *Agrostis capillaris* and red fescue *Festuca rubra*, and buck's-horn plantain *Plantago coronopus*.

The species tolerates only light shading, and most sites supporting the species have persistently very low vegetation that includes many small perennials. This short vegetation is maintained by low nutrient levels and often by intense grazing by rabbits, plus on some sites light trampling pressure from people. Increasing levels of atmospheric nitrogen, which promotes plant growth and invasive scrub are very harmful: scrub species that can be a particular problem in dune slacks include sea buckthorn, bramble and birch, and excessive creeping willow. The species also requires firm or compacted substrates and avoids very loose or mobile sand, thus excessive disturbance will be harmful. The species favours damp sites with the water table at or near the

surface. Most sites are dry for parts of a normal summer and wet or flooded during at least some winters.

Sources:

JNCC SAC Species Accounts
http://jncc.defra.gov.uk/ProtectedSites/SACselection/species.asp?FeatureIntCode=S1395
Terrestrial SAC species feature framework file://samnedfsn1/common/Exception%20-%20Frequent%20Access%20Spreadsheets/Conservation/Conservation%20Objectives/Feature%20Frameworks%20for%20supp%20advice/Final%20draft_terrestrial%20SAC%20Annex%20II%20species%20framework.xls

Ecosystem context

Petalwort is widespread in the Mediterranean region, North Africa and Turkey, its range extending northwards to the Algarve in Portugal and along the coasts of England, Wales, north-western Scotland and Ireland. It is patchily distributed throughout its range, being rather closely confined to dune slacks of a certain kind, which are under threat in many areas. The UK and Ireland may now be one of its most important strongholds.

The species has always been widely but sparsely distributed in the UK. A high proportion of the known localities are in south-west England and Wales. Some of the sites support large populations but in some parts of the species' range only small populations occur. The great majority of the sites are large dune systems with calcareous dune slack habitat.

Sources:

JNCC SAC Species Accounts
http://jncc.defra.gov.uk/ProtectedSites/SACselection/species.asp?FeatureIntCode=S1395

Holyoak, D.T. 2006. Petalophyllum ralfsii species dossier, Plantlife International.

Natural range and distribution

Metric

Metric: Localities
The distribution of Petalwort in England is well known, and due to the requirement of the species for damp calcareous dune slacks it has always been restricted to a limited number of sites. Within existing systems the species will move locations and wax and wane in abundance according to the dynamics of suitable dune slacks. There is a lack of knowledge about the dispersal potential and longevity of spores of the species, the distances across which it can move to new areas of suitable habitat without it being artificially translocated and how long spores remain viable in the ground in locations where the species used to occur.

Localities are defined as discrete geographical locations or SSSIs.

Historic range

The species is naturally restricted to damp calcareous dune slacks, which have a scattered distribution. In addition to the 10 current localities for the species, old records show that Petalwort has been lost from 4 other localities in England, namely Coatham Marsh (last record 1901), Freshfield on the Sefton Coast (1913), Berrow Dunes (1918), and an un-named site near Penzance (1949). Factors involved in these losses are likely to have been succession in dune slacks to taller shading vegetation, increased eutrophication, and possibly direct loss of sand dune habitat to development and agriculture. There are likely to have been other losses in the more distant past.

Source: *British Bryological Society database held by the Biological Records Centre, Date: All records up until and including 2013.*
Confidence: *Medium (it is likely that not all plants have been recorded and added to the database).*

Current range

The species is known from 10 localities* in England.

Source: *JNCC SAC Species Accounts*
http://jncc.defra.gov.uk/Publications/JNCC312/species.asp?FeatureIntCode=S1395
* Localities have been defined by referring to the BRC database and Atlas map, but if a less amalgamated approach was taken, for example by treating Penhale and Gear Sands as separate sites, then the number of localities would be increased

Range required for future maintenance of populations and diversity

Petalwort is restricted to damp calcareous dune slacks, with the exception of two uncharacteristic localities of (i) thin turf over gravel near Hale Harbour, Cornwall, and (ii) the site of a former car park at Braunton Burrows, Devon, the latter a site where the species also occurs in dune slacks. These dune slacks have a scattered distribution within Britain, thus Petalwort also has a naturally scattered distribution, and hence its British status is likely to remain Nationally Scarce. To ensure the survival of the species within its natural range, sustainable populations need to be maintained at all 10 known localities. This may be more difficult to achieve on some sites than others, for example the outlier site in Norfolk has only had small numbers of Petalwort recorded and none have been seen in the last five years, despite searching and despite a modest but targeted conservation effort.

The main pressures on the species relate to the succession of dune slacks to taller shading vegetation, and damage to sand dune habitat relating to such developments as caravan parks and agriculture. Increased eutrophication (e.g. from dog fouling or atmospheric deposition of nitrogen) encourages the growth of taller vegetation, and this is likely to have increased in the last 100 years due to the increase in human population and the intensification of agriculture. Rabbits are often of

much benefit to Petalwort due to their grazing of taller vegetation, and fluctuations in their populations may have a negative impact on the liverwort. Many sites have growing numbers of visitors. Increased trampling can potentially be beneficial by keeping vegetation from overshading Petalwort, but also may have negative impacts if too intensive. Managed retreat projects have increased in recent years, and these may pose a direct threat to Petalwort by allowing salt water to enter dune slacks.

With 10 healthy, well managed populations, the species can be conserved in its natural range and would be judged to be in favourable conservation status. The naturally small scale and scattered localities mean however that regular monitoring is needed to ensure that the conservation measures taken are effective.

Source: *3rd UK Habitats Directive Reporting 2013 England Submission.*
http://jncc.defra.gov.uk/pdf/Article17Consult_20131010/S1395_ENGLAND.pdf

Potential for restoration of the natural range

The species' range is naturally restricted. The potential for reintroducing populations to former sites will need to be assessed on a site by site basis. Dune restoration works have the potential to significantly benefit Petalwort, if carried out with sufficient regard for the species' requirements. Currently there are no known cases of successful reintroduction.

Favourable range

Favourable range is current range in England of 10 localities. The range has not been bigger in the recent past (last 50 years) and with 10 healthy, well managed populations, the species can be conserved in its natural range.

Re-establishment of the species at localities where there is potential would be beneficial to safeguard a situation above the favourable range reference. Restoration is subject to suitable substrate and functioning.

Monitoring and evaluation

It is suggested that range is assessed by checking records on the British Bryological Society database when possible, and in cases where these records are not sufficiently recent then by direct site survey by expert bryologists. A draft method for surveillance of Petalwort has been developed by Natural England (Natural England, 2013), and this provides guidance for estimating the abundance of the species, its distribution, and assessing the condition of its habitat.

Sources & Dates:
Blockeel, T., Bosanquet, S., Hill, M., & Preston, C. 2014. Atlas of British and Irish Bryophytes. Newbury: Pisces Publications.
Hill, M.O., Preston, C.D. & Smith, A.J.E. (eds.) 1991. Atlas of the Bryophytes of Britain and Ireland, Volume 1. Liverworts. Harley Books, Colchester.
Natural England, 2013. Natural England Draft Species Surveillance Method – Habitat Directive: Petalwort Petallophyllum ralfsii.

Comparison with situation in 1994

Favourable range is equal to the situation in 1994.

Population

Population metric

Metric: thalli population categories

Population sizes are assessed by Plantlife (Holyoak, 2006) using the following categories (numbers refer to the numbers of thalli):

1-10, 11-100, 101-1000, 1001-10,000, >10,000, >100,000

Callaghan (2013) considered that the estimates of the number of individual thalli of this very small bryophyte are often unreliable, particularly for larger populations, and that a more suitable metric used to define favourable population is the number of occupied 10 x 10m grid cells. As previous estimates to assess Petalwort have used thalli counts this method is retained here, however it is recommended that the Callaghan (2013) method is additionally used for future assessments, potentially for developing its use as a range metric.

***Sources*:**

Callaghan, D. 2013. The Grid-mapping of Species at Sites. British Wildlife 24 (5), 334-338.

Holyoak, D.T. 2006. Petalophyllum ralfsii species dossier, Plantlife International.

Historic populations

Data recorded and analysed for the 2014 Atlas of British and Irish bryophytes showed that some colonies have increased in recent years, notably in Cornwall (and also in Pembrokeshire, Wales), whilst others have declined as dune slacks have dried out through natural succession. The species is small and affected by weather and microhabitat changes, thus within individual localities it is likely there will be population fluctuations from year to year.

Sources & dates:

Blockeel, T., Bosanquet, S., Hill, M., & Preston, C. 2014. *Atlas of British and Irish bryophytes.* Newbury: Pisces Publications. ***Confidence:*** High

Callaghan, D. 2013. *Section 41 bryophytes of the Sefton Coast, Merseyside.* Unpublished report to Natural England. ***Confidence:*** High

Current population

The species is present in 10 localities* in England. These, together with their population categories (see above), comprise Holy Island (51-100), Ross Links & Bamburgh (11-50), Sefton Coast (501-1,000), Braunton Burrows(>1,000), Hayle Harbour and nearby (>1,000), Phillack Towans & Upton Towans (201-500), Gwithian Bridge (51-1000), Penhale & Gear Sands (101-200), Dawlish Warren (>1,000), and Holme-next-the Sea (51-100).

From the above data an approximate estimate is that the total number of Petalwort plants in England is in the region of 10,000.

(Hodgetts & Callaghan (2016) provided a population estimate of Petalwort within Britain as a whole as patches rather than individual thalli, and this total was between 2,500 and 10,000 patches).

(* Localities have been defined by referring to the BRC database and Atlas map, but if a less amalgamated approach was taken, for example by treating Penhale and Gear Sands as separate sites, then the number of localities would be increased).

Sources:

Hodgetts, N. G. & Callaghan, D. 2016. Revised Red List of Bryophytes in Britain, initial draft report to Natural England.

British Bryological Society database held by the Biological Records Centre, Date: All records up until and including 2013.

***Confidence**: Medium*

Population required for future maintenance of populations and diversity

The size of a minimum sustainable population of Petalwort Is not known. Larger populations and populations with stable or increasing numbers are assumed to signify healthier populations than smaller populations or those in decline. However, a large population does not necessarily safeguard the species at any one locality as it could easily disappear if conditions change (e.g. through saline incursion, or by shading by the growth of taller vegetation). Equally, a relatively small population may survive for decades under the right conditions. The view is taken here that a population > 1,000 thalli constitutes a healthy local population, whereas a population smaller than 100 is at risk. The capacity for a naturally functioning dune system to support a certain population size will vary from place to place, however, there will be instances where the expectation is for a far greater number of thalli or reason to accept there will be fewer.

In the absence of information indicating any lesser expectation, the national population will be regarded as at FCS when there are at least 1000 thalli at each of the 10 extant locations. However see comments in Favourable Population section below regarding population fluctuations.

***Source:** British Bryological Society database held by the Biological Records Centre*

***Date:** All records up until and including 2013.*

Potential for restoration of populations

There is potential to reinforce existing populations through dune slack management and restoration works. The scale of works required will vary from place to place.

It is considered that dune restoration works have the potential to significantly benefit Petalwort, if carried out with sufficient regard for the species' requirements, in particular for open dune slack habitat with very short vegetation and a seasonally high water table, with unpolluted ground water (Holyoak, 2006). Whilst minor management works intended to favour petalwort are, or have recently taken place at some localities (eg Holme Dunes NNR), more significant dune restoration works are needed and it is hoped that they will occur on at least one of the Petalwort sites in

England within the next decade (these works are currently at the proposal stage). Currently there are no known cases of successful reintroduction.

***Source*:** Holyoak, D.T. 2006. *Petalophyllum ralfsii* species dossier, Plantlife International.

Favourable population

Favourable population means sustainable populations in each of the locations, supported by the natural functioning of the system. It is estimated that 1,000 thalli would constitute a healthy population, but the capacity for a naturally functioning dune system to support a certain population size will however vary from place to place. Population class >1,000 thalli should be taken as a guide for each site, until a site-specific population class can be determined based on the natural functioning of the system. This is particularly important for Petalwort, as repeat surveys on the same site have shown that the population may exhibit large fluctuations between years (eg. one dune slack at Dawlish Warren in South Devon had 3 thalli recorded in 1997, >1000 in in 1999, and c. 250 in 2001).

Monitoring and evaluation

It is suggested that populations are assessed by checking those records on the British Bryological Society database that contain population data, and in cases where these records are not sufficient then by direct site survey by expert bryologists. It is recommended that population assessments are carried out ideally annually for Petalwort, or at least once every two years, as this will enable any pattern of population fluctuations within each site to be discovered, which is important for providing an apt assessment of Favourable Conservation Status. Once such a pattern has been discovered it might be appropriate to reduce the frequency of assessment.

Comparison with situation in 1994

Favourable Population is considered to be equal to or higher than the population when the directive came into force in 1994. It is not possible to be precise because, as is the case with many bryophytes, the population data necessary to define this is not available.

Habitat for the species

Metric
Hectare.
Historic area
It is likely that the area of suitable habitat available for colonisation by Petalwort will have decreased in the last 100 years. This is due to direct loss of sand dune habitat to development and agriculture, and succession in dune slacks to taller shading vegetation. Increased eutrophication (e.g. from dog fouling or atmospheric deposition of nitrogen) encourages the growth of such taller vegetation, and this is likely to have increased in the last 100 years due to the increase in human population, industry and the intensification of agriculture. Shipping may possibly be a source of atmospheric pollution on coastal dunes. Rabbits may benefit Petalwort due to their grazing of taller vegetation (Holyoak, 2006), and the large decline in their populations following the arrival of Myxomatosis in Britain in the early 1950s is likely to have had a negative effect on populations of Petalwort. Rabbit populations have recovered to some extent since then, but remain subject to large fluctuations. Many sites have growing numbers of visitors. Increased trampling can potentially be beneficial by keeping vegetation from overshading Petalwort, but also may have negative impacts if too intensive. Managed retreat projects have increased in recent years, and these may pose a direct threat to Petalwort by allowing salt water to enter dune slacks. ***Source:*** *Holyoak, D.T. 2006. Petalophyllum ralfsii species dossier, Plantlife International.*
Current area
Unknown. Suitable areas of habitat are difficult to define. The species typically grows in open, damp, calcareous dune slacks, often on low hummocks rather than on very wet ground, on compacted sandy/muddy bryophyte-rich open turf. Most localities are referable to Annex I type 2190 Humid dune slacks. However, not every humid dune slack provides suitable habitat for the species. It has occasionally been recorded in other coastal grassland where conditions are similar. The area directly occupied by Petalwort will vary from year to year due to population fluctuations. Suitable area should be determined on a site by site basis based on historic records and local conditions. A suitable metric would be 10m x 10m plots occupied in suitable habitat.
Area required for future maintenance of populations and diversity
The species is associated with calcareous dune slacks except for the two unusual areas described above. Petalwort is a very small species and does not require extensive areas to survive – of greater importance is the quality of the dune slack habitat, in particular that there is sufficient open damp ground that is not overshaded by taller vegetation, with a seasonally high water table, and not heavily eutrophicated or affected by increased salinity. The effects of climate change on Petalwort are not currently known.

Source: *Holyoak, D.T. 2006. Petalophyllum ralfsii species dossier, Plantlife International.*

Potential for habitat restoration

Habitat for the species can be (re)created by opening up dune slacks that are overgrown, or in the long term increasing dynamism in which new dune slacks can mature. However care should be taken with the latter approach so as to not inadvertently impact on the scarce existing areas that currently support the species. Petalwort requires open ground with surrounding vegetation kept low enough to prevent overshading, thus other dune slack species that require taller vegetation could potentially be disadvantaged by this.

There is a lack of knowledge about the dispersal potential and longevity of spores of the species, to determine over what distances suitable habitat for the species can be colonised without it being artificially translocated, and how long spores remain viable in the ground in locations where the species used to occur. There is also a lack of knowledge about the conditions required for the vegetative and sexual reproduction of Petalwort (Holyoak, 2006).

Source: *Holyoak, D.T. 2006. Petalophyllum ralfsii species dossier, Plantlife International.*

Confidence: *Low*

Favourable supporting habitat

Current area of favourable supporting habitat for Petalwort should be maintained, and increased locally when possible. On many sites it is likely that the area of suitable habitat for Petalwort, primarily dune slack, will be known, but if this is not the case then further appropriate habitat survey should be carried out. Increases in area may be needed locally to improve the sustainability of small populations, where this is appropriate with regard to the natural functioning of the dune systems. The size of this increase should be determined on a site-by-site basis (for example through eco-hydrological modelling). Large-scale dune restoration projects may be of significant benefit for Petalwort if they result in an increase in suitable dune slack habitat.

<u>Monitoring and evaluation</u>

It is suggested that the area of favourable supporting habitat is assessed by reference to recent habitat survey data, and in cases where these records are not sufficiently recent then by direct site survey. A national survey of all sites supporting Petalwort to determine area of suitable habitat, area occupied the species, and numbers of thalli would be very beneficial.

Annex 1: Third Habitats Directive Reporting

UK context from the 3rd UK Habitats Directive report

http://jncc.defra.gov.uk/pdf/Article17Consult_20131010/S1395_UK.pdf

UK conservation status:

- **Range:** Favourable, 2,568 km^2 *Confidence*: Complete survey or statistically robust estimate (although noted that range is not a good metric for this species as it is coastal, thus does not occur in the great majority of its range)
- **Population**: Inadequate, 26 localities (locality defined as SSSI/SAC or discrete geographical location) *Confidence:* Complete survey or statistically robust estimate
- **Habitat for the species: Inadequate**
- **Overall:** Inadequate

UK Favourable Reference Values (FRV:

- Range: no UK FRV reported, England FRV reported as 2,000 km^2
- Population: no UK FRV reported, England FRV reported as 10 localities

Proportion of UK species within England:

- 12/26 localities = 46%

Proportion of England species within protected sites:

- **N2K:** 9/12 localities = 75%

Source: *Source: 3rd UK Habitats Directive Reporting 2013, England Submission* http://jncc.defra.gov.uk/pdf/Article17Consult_20131010/S1395_ENGLAND.pdf

- **Protected areas outwith N2K:** SSSI feature within 2 non SAC SSSI units (Sefton Coast)

Source: *Designated sites view summary output – Natural England Internal Document*

European context from the 3rd Habitats Directive reports

Proportion of Atlantic biogeographic region within UK: 44.5%

Source: *European Topic Centre on Biological Diversity Article 17 species assessment for Atlantic biogeographic region.*

http://bd.eionet.europa.eu/article17/reports2012/species/summary/?period=3&group=Non-vascular+plants&subject=Petalophyllum+ralfsii&region=

Further information

Natural England evidence can be downloaded from our **Access to Evidence Catalogue**. For more information about Natural England and our work see **Gov.UK**. For any queries contact the Natural England Enquiry Service on 0300 060 3900 or e-mail **enquiries@naturalengland.org.uk** .

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Cover image
Petalwort *Petalophyllum ralfsii*
David Holyoak, Plantlife