The ISSN 1393 – 6670

Monitoring methods for *Petalophyllum ralfsii* (Wils.) Nees & Gottsche (Petalwort) in the Republic of Ireland

Irish Wildlife Manuals No. 90

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

Monitoring methods for *Petalophyllum ralfsii* (Wils.) Nees & Gottsche (Petalwort) in the Republic of Ireland

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Citation:

Campbell, C., Hodgetts, N. & Lockhart, N. (2015) Monitoring methods for *Petalophyllum ralfsii* (Wils.) Nees & Gottsche (Petalwort) in the Republic of Ireland. *Irish Wildlife Manuals*, No. 90. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.

Keywords: EU Habitats Directive, Annex II, monitoring, conservation status, habitat, ecology, liverwort, bryophyte

Cover photo: *Petalophyllum ralfsii* thalli, Truska, Co. Galway © C. Campbell

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Irish Wildlife Manuals Series Editors: F. Marnell & R. Jeffrey

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ISSN 1393 – 6670

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Executive Summary

Petalophyllum ralfsii is a thallose liverwort listed on Annex II of the EU Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna) that requires protection through designation of Special Areas of Conservation (SACs). *P. ralfsii*, commonly known as Petalwort, belongs to the family Petalophyllaceae and is distinguished from superficially similar species in the Fossombroniaceae family by an undissected thallus and the presence of distinctive erect, almost parallel, lamellae that radiate from the axis and which are perpendicular to the flattened part of the thallus. *P. ralfsii* is dioicous and produces sporophytes regularly in spring/early summer. It has a Mediterranean-Atlantic distribution and is not very widely occurring in Europe, with records from Spain (the Balearic Islands), Portugal, Greece, Italy, Malta, Ireland and Britain. Elsewhere it occurs in Cyprus, Turkey, Morocco, Algeria and Tunisia. It was first recorded in Ireland in 1861 and there are known to be 30 extant populations (localities) in the Republic of Ireland, occurring in the habitats machair and humid dune slack. Populations on machair in the West of Ireland are thought to be the largest in Europe. Due to the relatively large number of localities, *P. ralfsii* is categorised as *Least Concern* on the Irish Red List of rare and threatened bryophytes. However, as Ireland is a stronghold for *P. ralfsii* there exists an international obligation to protect and conserve the species and as such it is listed on the Flora (Protection) Order, 2015. Ireland also has a responsibility to monitor the populations under Article 11 of the EU Habitats Directive and, under Article 17, to report on the species' conservation status every six years under the parameters Range, Population, Habitat for the Species and Future Prospects. The current overall conservation status of the species in the Republic of Ireland is 'Favourable'.

A field survey of 13 of the 30 *P. ralfsii* localities was undertaken in 2009–2011 to record information on population size, structure, associated vegetation and environmental variables. Using multivariate analysis of associated vegetation data, the localities were classified into two main groups corresponding broadly to machair and dune slack habitats. From further analysis of data collected, ecological indicators and associated targets were derived to assess the conservation condition of each locality and monitoring methods were developed.

Acknowledgements

This project was funded by National Parks and Wildlife Service (NPWS), Department of Arts, Heritage and the Gaeltacht.

We would like to thank Dr Deirdre Lynn for her support. Thanks also to Dr Naomi Kingston of the World Conservation Monitoring Centre (WCMC), formerly of NPWS, for her support with GIS devices and programmes. Thanks to Paul Duffy of NPWS and Teresa Tuttle, formerly of NPWS, for production of the distribution and site maps.

Thanks to Dr David Holyoak for advice and assistance in the field.

Thanks to Dr Daniel Kelly, Department of Botany, School of Natural Sciences, University of Dublin, Trinity College, and Dr Noeleen Smyth, Royal Botanic Gardens, Kew, (formerly of National Botanic Gardens, Glasnevin) for supervision, advice and support throughout the project.

There are a number of people to thank for assistance during fieldwork, in particular Dr Karen Gaynor, Dr Emer Ní Dhúill, Dr Evelyn Gallagher, James Campbell, Geoff Campbell, Thomas Reynolds and Conor Ruane.

We are especially grateful to the NPWS Conservation Rangers for assistance in the field.

Introduction

Description of *Petalophyllum ralfsii*

Petalophyllum ralfsii (Wils.) Nees & Gottsche is a thallose liverwort commonly known as Petalwort. Other synonyms for this species are *Jungermannia ralfsii* Wils., *Diplolaena lyellii* f. *lamellosa* Nees, *Codonia ralfsii* (Wils.) Dumort., *Petalophyllum lamellatum* Lindb. and *Fossombronia corbulaeformis* Trabut (Lockhart *et al*., 2012a). It was formerly classified in the Fossombroniaceae, but is now placed in a newly described family, the Petalophyllaceae (Crandall-Stotler *et al*., 2002). The species was named after John Ralfs who discovered it in Anglesey in the mid-1800s (Porley & Hodgetts, 2005). It is distinguished from superficially similar species in the Fossombroniaceae by an undissected thallus and the presence of erect, almost parallel, lamellae that radiate from the axis and which are perpendicular to the flattened part of the thallus. Another distinguishing feature is that *P. ralfsii* has colourless rhizoids, whereas the rhizoids are purple in many *Fossombronia* spp. (except *F. caespitiformis* subsp. *multispira*). *P. ralfsii* can also be confused with *Moerckia flotoviana*, with which it can co-occur, but the thallus of the latter has very wavy margins and the sexual organs are covered by small, convex scales along the midrib (Atherton *et al*., 2010).

P. ralfsii has a rhizome-like subterranean axis which becomes tuberous at the apex of mature plants and which enables it to withstand long periods of desiccation (Paton, 1999); the above-ground parts can die back during the summer when conditions are drier. The tuberous parts are also thought to contain vesicular-arbuscular mycorrhizae (Smith & Read, 2008; Duckett *et al*., 2006), which may play a role in nutrition (Holyoak, 2000). Thalli can be solitary, in rosettes or in mats, each thallus generally measuring 1 to 10 mm in diameter.

P. ralfsii has the characteristic bryophyte life cycle of a dominant haploid gametophyte generation (each cell containing one set of chromosomes) and a shorter-lived diploid sporophyte generation. *P. ralfsii* is dioicous, i.e. the orange spherical male antheridia and the female archegonia, which are surrounded by erect involucres (bracts), occur on separate thalli. The species is often fertile (Paton, 1999). Sporophytes are produced regularly in late winter, spring and early summer. Spores are relatively large (40–56 μm) and may persist in the soil for long periods until environmental conditions become suitable for new plant production (Sim-Sim *et al*., 2000). *P. raflsii* is thought to be a short-lived shuttle species, displaying characteristics of the annual shuttle strategy as it produces frequent sporophytes with large spores (Sim-Sim *et al*., 2000). No specialised asexual propagules are known, but it can reproduce clonally by means of bifurcation whereby the thallus splits into two. Underground branches from the subterranean axes can also give rise to new thalli, which then become independent as the underground branches decay and presumably the process is continuous (Holyoak, 2000).

Its chromosome number is 9 (Paton, 1999) and it is considered to be haploid (Rumsey *et al*., 2001). Allozyme analysis carried out on *P. ralfsii* samples taken from 24 colonies in nine localities in Great Britain found monomorphism within 16 putative loci (Rumsey *et al*., 2001). However, allozyme analysis only represents a small fraction of the genome and so the species may not totally lack genetic variation.

Figure 1. (a) *Petalophyllum ralfsii* thallus showing male antheridia, Truska, Co. Galway; (b) Female thallus showing involucral bracts, Truska, Co. Galway; (c) Thalli showing lamellae parallel to thallus body, Truska, Co. Galway; (d) Immature thallus, Bull Island, Dublin; (e) Immature thallus, Rosses Strand, Co. Donegal.

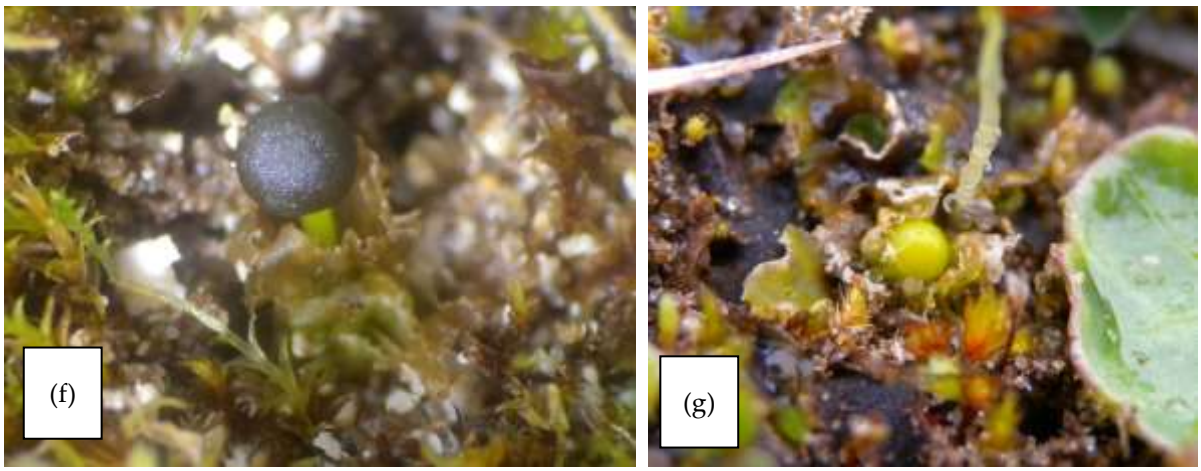

Figure 1 (continued). (f) *Petalophyllum ralfsii* thallus with emerging mature sporophyte, Truska, Co. Galway; (g) Female thallus showing immature sporophyte, Inch Spit, Co. Kerry.

Conservation obligations

Always regarded as a rare plant, partly because of its very specific habitat and partly because the above-ground part of the plant is often absent, it is listed as *Vulnerable* in the *Red Data Book of European Bryophytes* (European Committee for the Conservation of Bryophytes, 1995), although this list is in the process of being updated (Hodgetts, 2015). *P. ralfsii* appears on Appendix I of *The Convention on the Conservation of European Wildlife and Natural Habitats* (Bern Convention) of 1991. *P. ralfsii* is also listed on Annex IIb (given the species code 1395) of *The European Community Directive on the conservation of natural habitats and of wild fauna and flora* (the 'EU Habitats Directive'), which came into force in 1994. *P. ralfsii* is now included on lists of specially protected species in all signatory countries to the Bern Convention and the EU Habitats Directive. The EU Habitats Directive aims to maintain or restore habitats (listed on Annex I) and species (listed on Annexes II, IV & V) of conservation concern to a Favourable Conservation Status (European Commission, 1992; Evans & Arvella, 2011). It was transposed into Irish legislation in 1997 under the European Communities (Natural Habitats) Regulations (S.I. No. 94 of 1997).

Under Article 11 of the EU Habitats Directive, member states must carry out surveillance/monitoring of annexed species and under Article 17, every six years each member state must report to the European Commission on the measures taken under the Directive and on the conservation status of the listed species and habitats (European Commission, 1992; Evans & Arvela, 2011). The conservation status of a species is defined as the sum of influences acting on the target species that may affect the long-term distribution and abundance of its populations. There are four parameters (Range, Population, Habitat for the Species and Future Prospects) that must be met in a favourable way, i.e. given a classification of 'Favourable', for the conservation status to be given an overall classification of 'Favourable'. Member states are also required to designate Special Areas of Conservation (SACs) for Annex I habitats and Annex II species. All populations of *P. ralfsii* are contained within 21 SACs in the Republic of Ireland, in 20 of which it is listed as a qualifying interest. Populations that are listed as qualifying interests in SACs are protected by the Habitat Regulations (S.I. No. 477 of 2011), which regulates any plans or projects that might negatively impact on *P. ralfsii* populations. NPWS provide a list of Activities Requiring Consent (ARCs) that are only granted if they do not negatively impact on

any qualifying interests within an SAC. Although there is currently one SAC containing *P. ralfsii* where it is not yet listed as a qualifying interest (Barley Cove to Ballyrisode Point SAC), it is however also protected under other directives and legal instruments. It is afforded protected by the Environmental Liability directive (2004/35/EC, transposed into Irish law in the European Committees (Environmental Liability) Regulations 2008 (S.I. No. 547 of 2008)), which prevents and remedies environmental damage to natural habitats and protected species. It is also protected through listing on the Flora (Protection) Order, 2015 (FPO; S.I. No. 356 of 2015) which makes it illegal to cut, uproot or damage any FPO listed species or to damage or interfere with their habitats.

As a result of its listing on Annex II, targeted fieldwork on *P. ralfsii* across Europe increased and it is now clear that *P. ralfsii*, although certainly rare and very habitat-specific, is not as rare in Europe as was once thought. It is, for example, now regarded as *Nationally Scarce* in Britain (Church *et al.*, 2001; Preston, 2006), rather than a Red Listed species. In Ireland, *P. ralfsii* is considered *Least Concern* (Lockhart *et al*., 2012a; 2012b). Recent fieldwork has shown that the Republic of Ireland may well be a centre of distribution for the plant, with some very large populations on west coast machair systems. Indeed, it seems likely that the Republic of Ireland holds the highest proportion of the world population of *P. ralfsii* of any country in the world, and probably the largest populations (Porley *et al*., 2008), and therefore has an international responsibility for its conservation.

International distribution of *Petalophyllum ralfsii*

According to Hill *et al.* (1991), *P. ralfsii* is widespread in the Mediterranean region, including North Africa and Turkey, extending northwards along the Atlantic seaboard to Britain (and Ireland), and also occurs in the southern USA. However, Crandall-Stotler *et al.* (2002) consider American *Petalophyllum* to be specifically distinct from European material and have therefore described it as a different species, *P. americanum*. Hill & Preston (1998) include *P. ralfsii* in the Mediterranean-Atlantic element in their classification of floristic elements in Britain and Ireland. Ratcliffe (1968) also included *P. ralfsii* in his list of Mediterranean-Atlantic bryophytes.

According to Söderström *et al.* (2002), *P. ralfsii* is not very widely distributed in Europe, occurring only in Spain (in the Balearic Islands), Portugal, Greece (including Crete), Italy (including Sicily and Sardinia), Ireland and Britain.

There is now quite a large amount of information available on the distribution of *P. ralfsii* in individual European countries:

- Greece: at least two mainland localities, on the Peleponnese (Preston, 1981; Blockeel, 1991) and Evvia (T. Blockeel, pers. comm.). Also at least three localities on Crete: Chania, Triada & Komitades (Preston, 1981). There is at least one site on the Greek Island of Gavdopoula (Bergmeier *et al*., 2011).
- Italy: two mainland sites in Tuscany and two in Calabria (Aleffi & Schumacker, 1995). Also recorded from Lampedusa, Levanzo & Marettimo, small islands off the coast of Sicily, "on volcanic soil" (Jovet-Ast & Bischler, 1971; Dia *et al.*, 1985; Aleffi & Schumacker, 1995). The report of this species from Sardinia by Herzog (1905) was considered doubtful (Bischler & Jovet-Ast, 1972), but the species has subsequently been recorded there (Aleffi, 2005; Aleffi & Cogoni, 2008; Frahm *et al*., 2008).

- Malta: at least two locations (Jovet-Ast & Bischler, 1971; Dia *et al*., 1985; Frahm & Lüth, 2008).
- Portugal: two localities in the Algarve, where it "can benefit by grazing and some human activities" (Sim-Sim *et al*., 2000). A third locality was discovered in 2001 in Serra de Arrábida (Sérgio, 2002). A report from the Azores (Sérgio, 1994) is erroneous (Sérgio *et al*., 1994; Schumacker, 2001). *P. ralfsii* appears on the Iberian Red List as *Vulnerable* (Sérgio *et al*., 2006).
- Spain: only known from the Balearic Islands, where it has been recorded from five localities in Mallorca, two in Menorca, two in Ibiza and one in Formentera (Blockeel & Crundwell, 1987; Casas, 1998; also listed in Cros *et al*., 2008). Habitats listed are clayey soil in a river mouth, on a steep riverbank, on a roadside, among pine litter in a shaded north-facing gully, on flat clayey surfaces, and a 'rushing stream'. A revision of specimens from mainland Spain showed that they were errors (M. Brugués, pers. comm.).
- United Kingdom: as of 2012, *P. ralfsii* was recorded from twelve localities in Wales, twelve in England, one in Scotland and one in Northern Ireland (at Ballymaclary National Nature Reserve (Magilligan Special Area of Conservation)) (Joint Nature Conservation Committee, 2013). Dune systems in Wales and Cornwall are particularly important for this plant, and the Scottish locality is the species' most northerly station in the world. It has been refound at nearly all of its historical localities, and some of the populations are large (British Bryological Society Threatened Bryophyte Database).

The EUNIS database (European Nature Information System) gives the following information on *P. ralfsii* in EU countries:

- Ireland: 20 sites
- Italy: 15 sites
- Malta: 2 sites
- Portugal: 1 site
- Spain: 5 sites
- United Kingdom: 14 sites

(http://eunis.eea.europa.eu/species/4806/sites)

Presumably these are key sites/Special Areas of Conservation (SACs) for *P. ralfsii* in the Natura 2000 network, rather than a comprehensive site list for each country. However, different countries may have interpreted EUNIS criteria in different ways.

P. ralfsii occurs in Cyprus (Frahm *et al*., 2009; Blockeel, 2003) and is also found in Turkey (Kürschner & Erdağ, 2005; Kiremit, 2007; Kirmaci & Ağcagil, 2009; Kirmaci & Erdağ, 2010). In North Africa, *P. ralfsii* has also been recorded in Morocco, Algeria and Tunisia (Battandier & Trabut, 1886; Trabut, 1887; Stotler *et al*., 2002; Ros *et al*., 2007).

Distribution of *Petalophyllum ralfsii* in the Republic of Ireland

P. ralfsii was first recorded in the Republic of Ireland in 1861 near Malahide by B. Carrington (herbarium specimen in DBN). It was subsequently recorded on the North Bull, in north Dublin Bay by D. Moore in 1874 (Moore, 1877), at 'west of Inny Ferry', Waterville, Co. Kerry by R.W. Scully in 1890 (Scully, 1890), on Achill Island by Rev. H.W. Lett in 1903 and on Clare Island, again by Rev. Lett, in 1920. Most of these records are supported by herbarium specimens. A handful of 'new' populations were discovered in the 1950s and 1960s, but recent fieldwork by N. Lockhart of the National Parks & Wildlife Service (NPWS) from 1998 on, following the inclusion of *P. ralfsii* on the Bern Convention and EU Habitats Directive, revealed several hitherto-undiscovered populations, many of them large. *P. ralfsii* is now known from 30 localities (a locality is a discrete location where a *P. ralfsii* population has been recorded) in the Republic of Ireland from the counties of Kerry, Cork, Clare, Galway, Dublin, Mayo, Sligo and Donegal. Nearly all the *P. ralfsii* localities are found in coastal dune systems with damp, calcareous slacks or machair. It may have disappeared from some localities, for example, it was found once at Banna, Co. Kerry, by A.P. Fanning in 1954, but has not been refound there, in spite of searching, and the absence of *P. ralfsii* is mostly probably attributable to eutrophication of groundwater from intensive agricultural activity. It has almost certainly disappeared from Malahide, where its habitat has largely been destroyed. Neither was it refound during recent fieldwork on Clare Island. One anomalous locality was an old limestone quarry near Derry, by Lough Arrow, Co. Sligo, where *P. ralfsii* was found by Jean Paton in 1970, but this appears to have been a transient population. A pre-2008 specimen from Co. Cork was redetermined as *Fossombronia husnotii* (D. Holyoak, pers. comm.). However, a *P. ralfsii* population was subsequently found at Barley Cove, Co. Cork in October 2012 by N. Lockhart of NPWS.

P. ralfsii has been recorded in recent (post-1998) fieldwork as part of the NPWS programme of rare and threatened bryophyte surveys in the following counties: Kerry (six localities); Clare (one locality); Galway (five localities); Dublin (one locality); Mayo (seven localities); Sligo (one locality); Donegal (eight localities) and Cork (one locality) (Sources: NPWS database; Blockeel & Long, 1998; Hodgetts, 2003; Hodgetts, 2006; Holyoak, 1999; Holyoak, 2002; Holyoak, 2003; Holyoak, 2004; N. Lockhart, pers. comm.). The distribution of *P. ralfsii* in the Republic of Ireland, as currently understood, is shown in Figure 2. Only confirmed records are mapped.

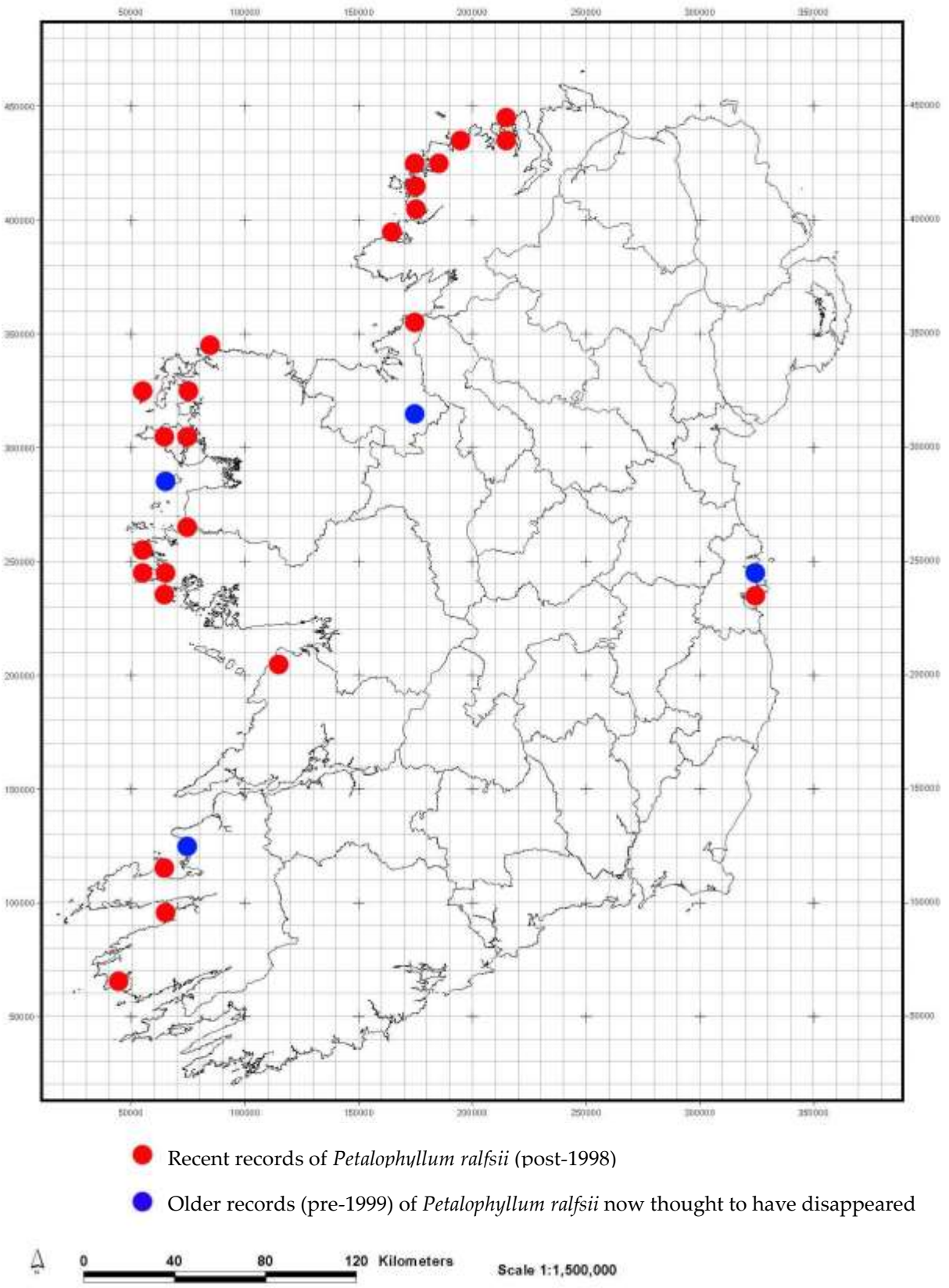

Figure 2. Distribution map of *Petalophyllum ralfsii* in the Republic of Ireland.

There are currently thought to be 30 extant localities of *Petalophyllum ralfsii* in the Republic of Ireland, which occur within 21 SACs (Table 1).

Table 1: *Petalophyllum ralfsii* localities with the county, Special Area of Conservation (SAC) names (and SAC codes) they fall within.

Locality	County	Special Area of Conservation (SAC) name	SAC code
1. Rosses Strand	Donegal	Tranarossan and Melmore Lough	IE000194
2. Rosepenna	Donegal	Sheephaven	IE001190
3. Tramore/Black Burrow/SW of Dunfanaghy	Donegal	Horn Head and Rinclevan	IE000147
4a. Damph Beg, 4b. Derrybeg & 4c. Keadew Point	Donegal	Gweedore Bay and Islands	IE001141
5a. Dooey Point & 5b. Sheskinmore	Donegal	West of Ardara/Maas Road	IE000197
6. Bunduff Machair	Sligo	Bunduff Lough and Machair/Trawalua/Mullaghmore	IE000625
7. Garter Hill	Mayo	Glenamoy Bog Complex	IE000500
8a. Doolough Machair & 8b. Dooyork Machair	Mayo	Mullet/Blacksod Bay Complex	IE000470
9. North Inishkea	Mayo	Inishkea Islands	IE000507
10. Doogort Machair	Mayo	Doogort Machair/Lough Doo	IE001497
11. Keel Machair	Mayo	Keel Machair/Menaun Cliffs	IE001513
12. Dooaghtry	Mayo	Mweelrea/Sheeffry/Erriff Complex	IE001932
13. Omey Island Machair	Galway	Omey Island Machair	IE001309
14a. Mannin More, 14b. Truska Machair & 14c. Doon Hill/West of Aillebrack	Galway	Slyne Head Peninsula	IE002074
15. Murvey Machair	Galway	Murvey Machair	IE002129
16. Fanore	Clare	Black Head-Poulsallagh Complex	IE000020
17a. SW of Lough Naparka, 17b. Magherabeg & 17c. Kilshannig	Kerry	Tralee Bay and Magherees Peninsula, West to Cloghane	IE002070
18a. Inch Spit & 18b. Rosbehy	Kerry	Castlemaine Harbour	IE000343
19. West of Inny Ferry	Kerry	Ballinskelligs Bay and Inny Estuary	IE000335
20. North Bull	Dublin	North Dublin Bay	IE000206
21. Barley Cove*	Cork	Barley Cove to Ballyrisode Point	IE001040

* Recent find of *P. ralfsii*; the species is not yet selected as a qualifying interest for SAC 001040.

The location of the numbered localities in the Republic of Ireland can be seen in Figure 3.

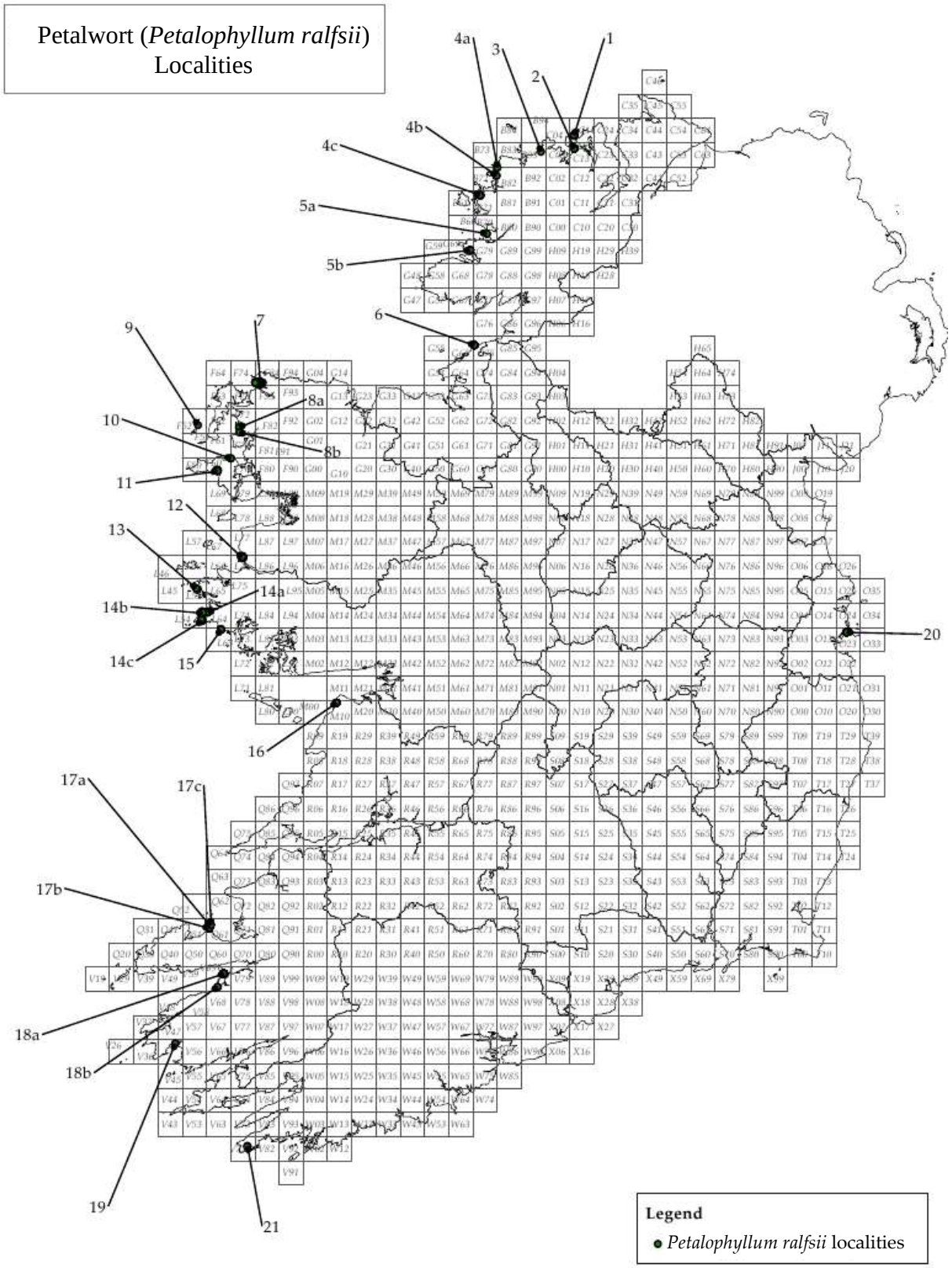

Figure 3. Locations of *Petalophyllum ralfsii* localities in the Republic of Ireland (see Table 1 for key to locality number and details).

There are four localities where confirmed records of *P. ralfsii* have been reported, but where it is now thought to be extinct, or not seen in over 25 years. Details of these populations follow.

1. Near Derry, Lough Arrow, Co. Sligo

P. ralfsii was recorded at this location (grid ref. G71) in 1970 by Jean Paton, from an old quarry near Lough Arrow. This is the only non-coastal site from which this species has been recorded in Ireland.

Field notes from Neil Lockhart (11 March 1998):

Visited an old gravel pit/quarry in Ballindoon Townland, almost certainly the site of Jean Paton's 1970 record. The quarry has become a bit overgrown and is now disused, whereas the GSI aerial photograph (1977) shows it as more open. It is now heavily poached by cattle, and although several typical associates of *P. ralfsii* were seen (*Aneura pinguis, Riccardia multifida*, etc.), no *P. ralfsii* was found. The plant is unlikely to still occur here and its prospects for survival here must be considered slim as the area becomes more vegetated.

2. Malahide, Co. Dublin (Malahide Estuary SAC IE000205)

P. ralfsii was recorded from this site (grid ref. O24) between 1861 and 1904, but has not been seen since. A brief visit by Nick Hodgetts in 2006 revealed no potential habitat for the plant. Habitat has either been destroyed by coastal developments, or else it has been subsumed by golf courses, where the slacks are too dry.

3. Clare Island, Co. Mayo

P. ralfsii was recorded on Clare Island (grid ref. L68) in 1920 by H.W. Lett, but has not been seen since. A survey by David Holyoak in 2003 failed to refind it.

4. Akeragh, Banna & Barrow Harbour SAC (IE000332), Co. Kerry

P. ralfsii was recorded at this location (grid ref. Q72) in 1954 by A.P. Fanning, but recent visits have failed to refind it.

Field notes from Neil Lockhart (27 January 1998):

Several likely-looking areas were found and examined in detail, but the absence of *P. ralfsii* is mostly probably attributable to eutrophication of groundwater from intensive agricultural activity. Several of the slack areas were used as 'stock yards' for cattle, with ring feeders and silage brought in during winter. Nearly all of the dunes are heavily used by cattle, and some horses, and the entire area of low-lying land to the east is intensively farmed for cattle. The smell of slurry spreading was evident. Several slacks or wet depressions occur, but these support mostly coarse bryophytes, or have been destroyed by cattle. It is probably significant that no truly calcicole bryophytes were seen at all.

Habitat of *Petalophyllum ralfsii*

In Ireland and Great Britain, *P. ralfsii* is a lowland calcicole and a pioneering species of bare moist stable, compact sand or in short turf mainly on mildly to strongly base-rich dune slacks and machair, where it is subject to inundation in the winter (Lockhart *et al*., 2012a; Paton, 1999). Curtis (1991) describes machair habitat as a mature coastal sand-plain with a more or less level surface, with a lime-rich sand (pH > 7.0) composed of a large proportion of shell fragments, with a grassland vegetation containing a low frequency of sand-binding species, occurring in a moist, cool, oceanic climate. The largest populations in Ireland are found in the west of Ireland on machair, which is listed as a priority habitat on Annex I of the EU Habitats Directive. *P. ralfsii* is found in dune slacks in the earlier stages of development and prefers soil that is compact and bare, for example at the sides of paths, and does not grow in slacks that are water-filled for long periods or that are heavily shaded (Church *et al*., 2001; Lockhart *et al*., 2012a). The habitat 'Humid Dune Slack' is also listed on Annex I of the EU Habitats Directive. Frequent associates include *Aneura pinguis*, *Didymodon* spp., *Bryum* spp., *Dicranella varia*, *Pressia quadrata*, *Riccardia* spp. and *Trichostomum* spp. (Hill *et al*., 1991). It is mainly a coastal species, but an inland population was found by J. Paton in a calcareous quarry about 20 km inland in Co. Sligo, where it is now thought to be extinct and merely a transient occurrence (Lockhart *et al*., 2012a).

P. ralfsii has been found growing on thin sandy soil overlying copper mine spoil and on mortared brickwork of an old building in Cornwall (Holyoak, 2012). On the Greek island of Gavdopoula, it grows in the only permanently humid microhabitat on the island which is created by large boulders on eastern sea cliffs supporting populations of Cory's shearwater, where the ground is trampled by the birds (Bergmeier *et al*., 2011). At two localities in the Algarve, Portugal, it grows on flat compact seasonally wet calcareous soils in shaded habitats, which remain stable for years, on the margins of areas with carob and olive trees and on the margins of rural trails *circa* 12 km from the coast at 200–250 m altitude (Sim-Sim *et al*., 2000).

A detailed field survey of 13 *P. ralfsii* localities, including the largest sites and those representing the geographic distribution in the Republic of Ireland, was undertaken in 2009–2011 to record information on population structure, associated vegetation and environmental variables (Campbell, 2013). Multivariate analysis from 57 plots (25 cm x 50 cm) revealed that, overall, the plots clustered together by habitat type into a machair group and a dune slack group. The localities studied in Donegal could not be described as typical dune slack habitat however, as *P. ralfsii* grows on a flushed slope (Rosses Strand), on peaty sand above limestone (Sheskinmore), on thin humic sand over rock beside the shore (Keadew Point) and on a sandy track (Rosepenna). The locality at Fanore, Co. Clare is also unusual as *P. ralfsii* grows there on damp soil *circa* 25 cm deep over limestone.

The pH of soil samples taken at the plots ranged from 7.42 to 8.37 (7.61 to 8.19 in machair plots and from 7.42 to 8.37 in dune slack plots) and the most frequently occurring associated species in all plots were *Festuca rubra* (occurring in 100% of plots), *Carex flacca* (78.9%), *Agrostis stolonifera* (75.4%), *Trifolium repens* (75.4%), *Bellis perennis* (71.9%), *Plantago coronopus* (56.1%), *Didymodon fallax* (54.4%), *Aneura pinguis* (52.6%), *Bryum pseudotriquetrum* (52.6%), *Leontodon autumnalis* (52.6%) and *Plantago lanceolata* (50.9%).

Figure 4 shows a dune slack habitat containing *P. ralfsii* at Bunduff, Co. Sligo and Figure 5 shows a machair habitat with *P. ralfsii* occurring at Truska, Co. Galway.

Figure 4. Dune slack containing a *Petalophyllum ralfsii* population at Bunduff, Co. Sligo.

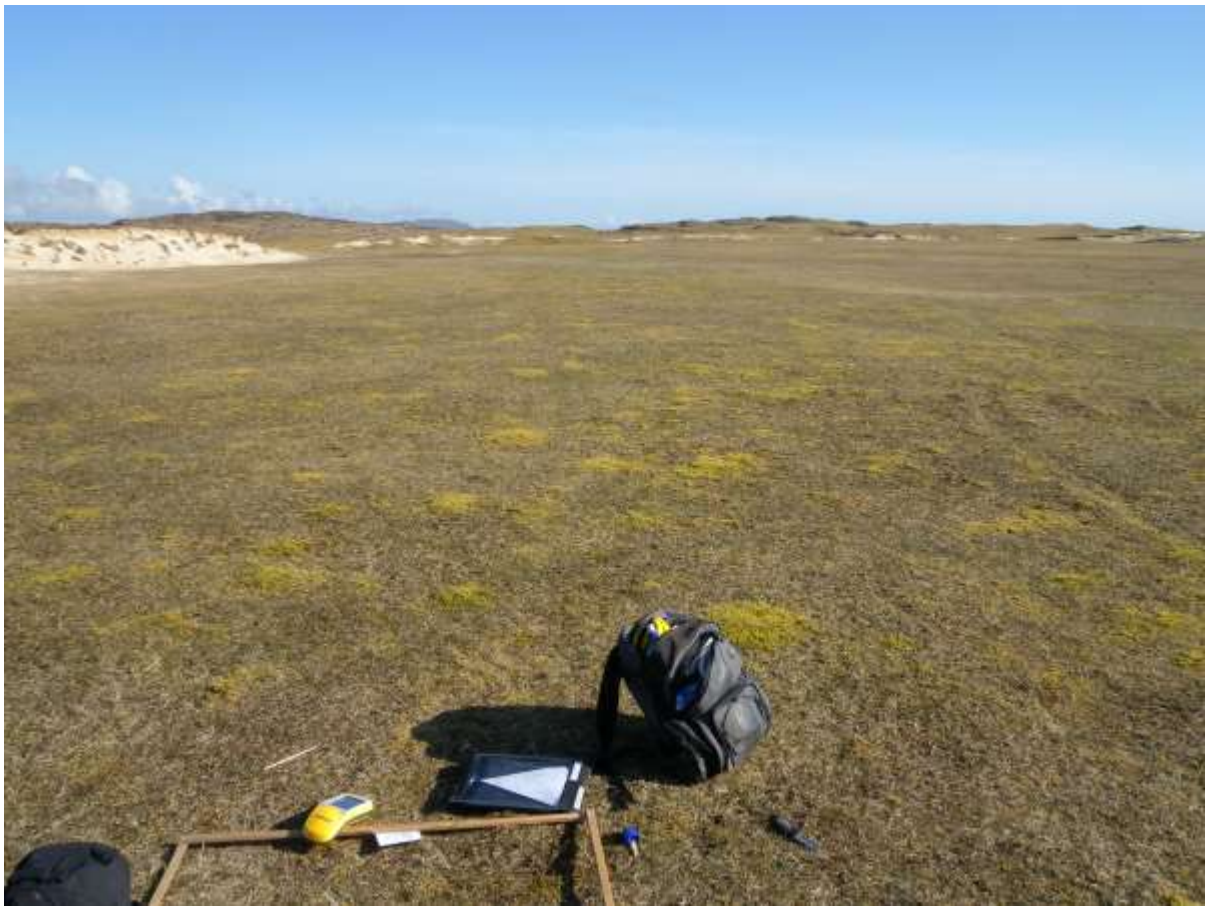

Figure 5. Machair habitat with *Petalophyllum ralfsii* at Truska, Co. Galway.

Introduction to monitoring of *Petalophyllum ralfsii*

The ultimate goal of rare species conservation is the maintenance of viable populations in their natural habitat. Knowledge of a rare bryophyte's biology and environmental requirements, and the variations within them, is necessary to propose accurate conservation measures (Söderström *et al*., 1992), i.e. to maintain or re-establish the conditions that allow the long-term survival of the particular species (Bisang & Hedenäs, 2000). The effectiveness of the measures should be evaluated through monitoring (Hallingbäck & Hodgetts, 2000). Monitoring of abiotic and biotic parameters at regular time intervals is essential for good management (Fojt, 1995) and can highlight any problems that can then be addressed.

Article 11 of the EU Habitats Directive requires each Member State to undertake 'surveillance' of the conservation status of listed habitats and species. According to Jones *et al.* (2006), "The overall purpose of surveillance and reporting is to identify, and draw attention to, weaknesses in the state of the environment which will need to be addressed if the vision and strategic goals are to be achieved". This document goes on to say that surveillance, which is considered an essential companion to monitoring, is "systematic sampling designed to produce a series of measurements in time and the term is used here to encompass monitoring when the need is to know whether a particular state or standard is being achieved".

According to the Joint Nature Conservation Committee's *Common Standards Monitoring for Designated Sites: First Six Year Report* (Joint Nature Conservation Committee, 2006), monitoring performs the following functions:

- it indicates the degree to which current conservation measures are proving effective in achieving the objectives of the designation at site level, and identifies any need for further measures;
- it indicates the effectiveness of current conservation action and investment at country level, and identifies priorities for future action;
- it enables Government to undertake its national and international reporting commitments in relation to designated sites, and more widely, and helps identify any areas of shortfall in implementation.

Under Article 17 of the EU Habitats Directive, every six years, each member state must report to the European Commission on the measures taken under the Directive and on the conservation status of the listed species and habitats (European Commission, 1992; Evans & Arvela, 2011). 'Favourable Conservation Status' (FCS) is the overall objective to be reached for all habitat types and species of community interest and can be described simply as a situation where a habitat type or species is prospering (in both quality and extent) and with good prospects to do so in future as well, without any change to existing management or policies (Evans & Arvela, 2011).

The conservation status of a listed species is defined as the sum of influences acting on the target species that may affect the long-term distribution and abundance of its populations. There are four parameters - Range, Population, Habitat for the Species and Future Prospects - that must be met in a favourable way for the species' conservation status to be given an overall classification of 'Favourable'.

The four parameters of Range, Population, Habitat for the Species and Future Prospects are considered Favourable when:

- the natural range of the target species is neither declining nor is likely to decline in the foreseeable future;
- population dynamics data suggest that the target species populations are maintaining themselves on a long-term basis as a viable component of its natural habitat;
- there is, and will continue to be, a sufficiently large habitat for the populations to maintain themselves into the long-term future and
- future prospects for their overall survival must also be deemed favourable.

If any of these parameters are not in 'Favourable' condition then an 'Unfavourable' status must be given following a rules-based approach (Evans & Arvela, 2011). There are two categories of Unfavourable status: 'Unfavourable - Inadequate', where a change in management or policy is required to return the species to 'Favourable' status and 'Unfavourable - Bad', where the species is in serious danger of becoming extinct (at least regionally) (Evans & Arvela, 2011). There is also an 'Unknown' category, where there is insufficient information available to allow an assessment (Evans & Arvela, 2011). For a 'Favourable' Overall Assessment (colour-coded Green) all parameters must be assessed as 'Favourable' (with one 'unknown' acceptable); if any one of the parameters is assessed 'Unfavourable - Bad' the Overall Assessment is also 'Unfavourable - Bad' (colour-coded Red); any other combination would result in an 'Unfavourable - Inadequate' Overall Assessment (colour-coded Amber).

The national assessment to determine overall conservation status of Annex II species brings together information on Range, Population, Habitat for the Species and Future Prospects for each species. The last reporting round was 2007–2012, with reports submitted to the European Commission in 2013. The next submission will be in 2019 (reporting on the conservation status in the period 2013–2018).

Full details of the Article 17 Species Conservation Assessment for *P. ralfsii*, 2007–2012, can be accessed at http://www.npws.ie/publications/2013-article-17-conservation-status-assessments

Introduction to Range Assessment for *Petalophyllum ralfsii*

The parameter 'Range' is the outer limits of the overall area in which a species is found at present and can be considered as an envelope within which areas actually occupied occur, as in many cases not all the range will actually be occupied by the species (Evans & Arvela, 2011; European Commission, 1992). This can be a difficult concept for bryophytes, which tend to occur in often very scattered or disjunct populations, with plants occupying small 'micro-habitats' within larger, more generally recognised habitats. However, it is relatively easy to determine the range of *P. ralfsii*, because its habitat is well-circumscribed and its extent well-known. The sort of damp calcareous sandy ground where this species grows is highly characteristic of the 'major habitats' machair and dune slack.

Favourable Reference Values are set for Range and Population; these are targets against which current values are judged. These reference values should be at least equal to the value when the Directive came into force, unless this value is not deemed to be enough to ensure the long term survival of the species being assessed. Favourable Reference Values should be based purely on scientific grounds and

may have to change between reporting cycles as our understanding of a habitat type or species changes (Evans & Arvela, 2011).

The Favourable Reference Value for Range is the total geographical area within which all significant ecological variations of the habitat or species are included and which is sufficiently large to allow the long-term survival of the species.

The Favourable Reference Range (FRR) of *P. ralfsii* in the Republic of Ireland is taken to be its present range i.e. a polygon drawn around all the 10 km² squares from which *P. ralfsii* has been recorded recently (1998–2012), encompassing a further 6 cells that could potentially support the species due to geological and edaphic reasons. This is thought to encompass the ecological range of variation for the species in the Republic of Ireland. Furthermore, dune systems and machair in the Republic of Ireland have been extensively surveyed in recent years, and most significant populations of *P. ralfsii* are likely to have been found. As a consequence of recent surveys, the current known range of *P. ralfsii* is greater than it has been at any time in the past, simply because many populations of the species were not previously known about. The range of *P. ralfsii* may actually have declined, but there is no evidence for this, again because of the paucity of previous survey work.

The distribution and consequential Range value derived from the 1998–2012 field surveys (Campbell (2013) and additional NPWS records) is considered to be the baseline for *P. ralfsii.* As there is no evidence of a decline since the Directive came in to force, the current range is set as the Favourable Reference Range. There is an assumption that the current range is large enough to encompass all the ecological variation and ensure the long-term survival of the species.

Comparison between detailed surveys from 2009–2011 (Campbell, 2013) and NPWS bryophyte files indicate that there have been no losses across the distribution in the recent past, therefore the short-term trend for Range is considered to be stable.

At present, as the 2007–2012 range of the species is the same as the FRR, it is allocated a Favourable conservation status in this respect.

- **Species Range Area:** Can be considered as either the area of the grid cells occupied by the habitat which is 3,200 km² (32 grid cells x 100 km²) or the area of the polygon which contains all of the grid cells, which is also 3,200km²
- **Favourable Reference Range:** 3,200 km² (32 grid cells x 100 km²).

The 2013 conservation assessment range map consists of 32 current range cells, including the 26 current distribution cells (cells containing actual *P. ralfsii* localities) and the further 6 cells that could potentially support the species due to geological and edaphic reasons. The range of *P. ralfsii* in the Republic of Ireland can be seen in Figure 6.

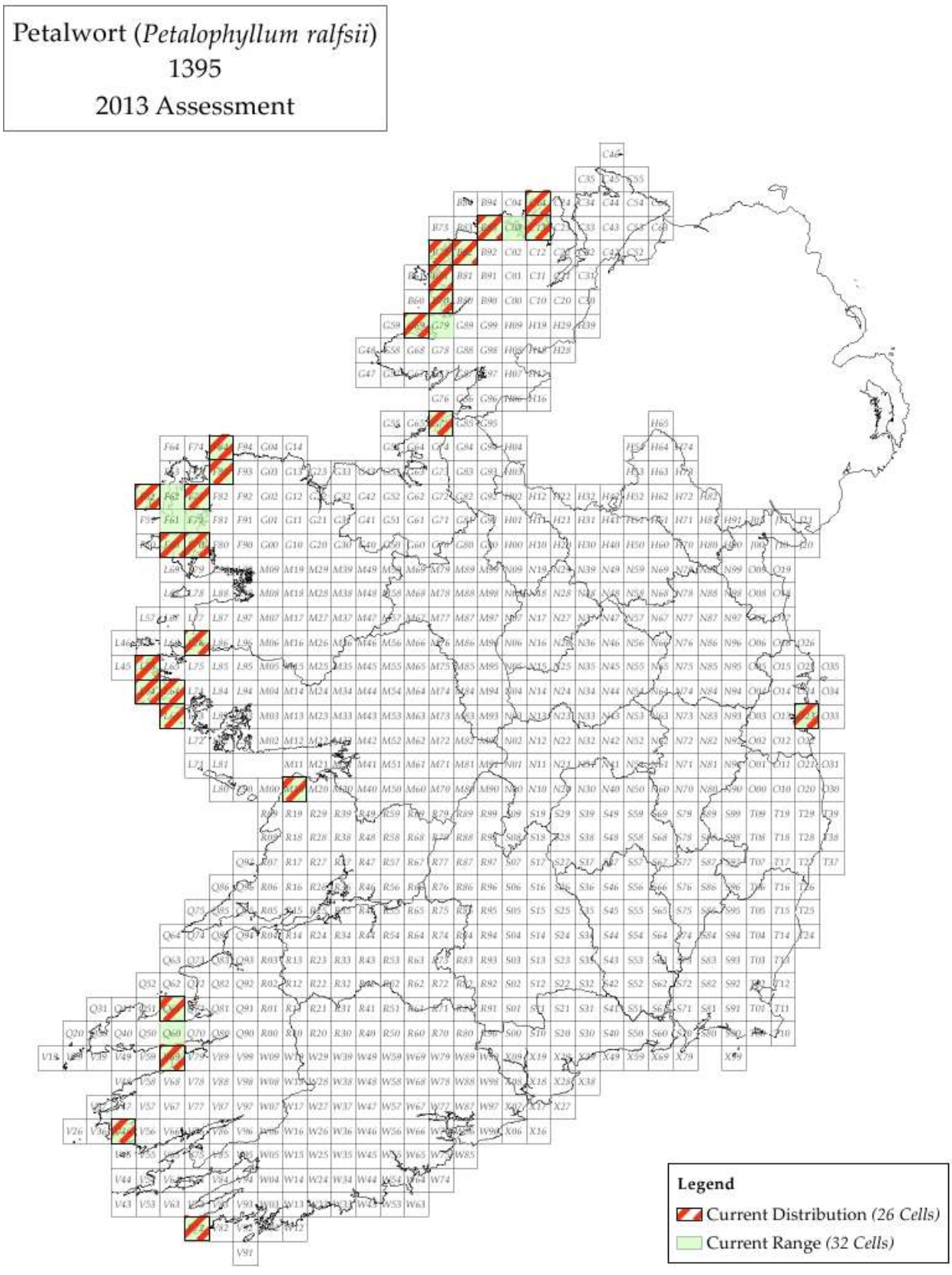

Figure 6. The distribution and range of *Petalophyllum ralfsii* in the Republic of Ireland.

Introduction to Population Assessment for *Petalophyllum ralfsii*

There are a number of problems in estimating bryophyte populations, notably the difficulty in deciding what constitutes 'an individual'. In the case of *P. ralfsii*, a single thallus could be taken to be an individual, although this takes no account of the fact that thalli might be connected by underground structures, or that some populations might consist of clonal swarms (Hallingbäck *et al.*, 1996).

For the 2001–2006 reporting period for Article 17 of the EU Habitats Directive, the measure of population estimation for *P. ralfsii* was 'number of localities' (Evans & Arvela, 2011). A 'locality' is defined as a discrete location where a *P. ralfsii* population has been recorded. At that time there were 29 known localities, in 20 SACs, in the Republic of Ireland. Since then, an additional locality, also in an SAC, has been reported, so at present there are 30 localities, in 21 SACs.

For the 2007–2012 reporting period, and to facilitate comparison between EU Member States, the recommended unit for estimating the population of *P. ralfsii* was the 'area covered by the population in m²' (Evans & Arvela, 2011). To measure this, Campbell (2013) delimited the extent of occurrence of 13 of the largest and most representative populations by recording the GPS positions at the extent to where *P. ralfsii* occurred at each locality. A polygon around these points defines the area of occupancy (m²). Not all niches within the ascertained area of occupancy were suitable for *P. ralfsii*; some being too wet, too dry or too overgrown with coarse vegetation. Therefore, the area covered by the population (m²) was estimated from field observation by reducing the area of occupancy to the percentage of suitable niche, i.e. area covered by the population (m²). The area covered by *P. ralfsii* at the 17 remaining localities, all of which are small in extent, was calculated from estimates made in the field from NPWS surveys.

The area covered by the population (m²) per locality was summed to give a national area covered by the population estimate of 399,604.3 m², i.e. *ca*. 399,600 m².

Campbell (2013) also quantified the number of individuals at each of the 13 localities studied in 2009–2011 by counting numbers of thalli in sample 1 x 1 m plots, with repeat counts in a selection of plots over the years 2010 and 2011. The mean number of thalli per m² per year was calculated for each of the 13 localities. The area covered by the population (m²) was multiplied by the mean number of thalli/m² of the lowest year to derive a minimum population estimate, and by the mean number of thalli/m² of the highest year to derive a maximum population estimate for each of the 13 localities.

Minimum and maximum thalli counts for the 17 remaining localities were calculated from estimates made in the field from NPWS surveys.

The minimum and maximum counts were summed to determine a minimum national population estimate of 3,609,457 i.e. *c*a. 3,609,450 thalli and a maximum national population estimate of 15,097,303 i.e. *ca*. 15,097,300 thalli.

Details of population estimates (in terms of number of thalli and area covered by population (m²)) for *Petalophyllum ralfsii* at its 30 localities in the Republic of Ireland for the 2013 Conservation Assessment, are listed in Table 2.

Table 2: Details of population estimates in terms of number of thalli and area covered by the population (m^2) for all *Petalophyllum ralfsii* localities in the Republic of Ireland for the 2007–2012 conservation assessment.

Locality	**Numbers of thalli in each locality for the 2007-2012 assessment**	**Area covered by the population (m^2) for the 2007-2012 assessment**
1. Rosses Point	Min.: 110 thalli; Max.: 360 thalli (2009–2011 survey; Campbell)	20 m^2
2. Rosepenna	Min.: 0 thalli; Max.: 1,123 thalli (2009–2011 survey; Campbell)	1,123 m^2
3. Tramore	3 thalli (2002 survey; Holyoak)	0.06 m^2
4a. Damph Beg	24 thalli (1999 survey; Holyoak); 7 thalli (2002 survey; Holyoak); 0 thalli (2006 survey; Lockhart)	0.5 m^2
4b. Derrybeg	3 thalli (2002 survey; Holyoak); 12 thalli (2006 survey; Holyoak)	0.5 m^2
4c. Keadew Point	Min.: 42 thalli; Max.: 115 thalli (2009–2011 survey; Campbell)	21 m^2
5a. Dooey Point	4 thalli (1999 survey; Holyoak); 3 thalli (2002 survey; Holyoak)	0.5 m^2
5b. Sheskinmore	Min.: 28 thalli; Max.: 154 thalli (2009–2011 survey; Campbell)	14 m^2
6. Bunduff	Min.: 60 thalli; Max.: 405 thalli (2009–2011 survey; Campbell)	44 m^2
7. Garter Hill	Min.: 1,466,418 thalli; Max.: 7,865,331 thalli (2009–2011 survey; Campbell)	148,123 m^2
8a. Doolough	20 thalli (1998 survey; Lockhart); 77 thalli (1999 survey; Holyoak); 3 thalli (2006 survey; Lockhart)	0.5 m^2
8b. Dooyork	6 thalli (1998 survey; Lockhart); 0 thalli (1999 survey; Lockhart)	4 m^2
9. North Inishkea	7 thalli (1998 survey; Lockhart)	0.25 m^2
10. Doogort Machair	258 thalli (2010 survey; Campbell)	0.75 m^2
11. Keel Machair	800–2,000 thalli (1998, 1999, 2003 & 2006 surveys; Holyoak; Lockhart)	10,267 m^2
12. Dooaghtry	Min.: 1,197,375 thalli; Max.: 2,011,590 thalli (2009–2011 survey; Campbell)	95,790 m^2
13. Omey Island Machair	304 thalli (1998 survey; Lockhart); 6 thalli (2006 survey; Lockhart)	1,020 m^2
14a. Mannin More	*Circa* 80,000 thalli (2006 survey; Lockhart)	19,970 m^2
14b. Truska Machair	Min.: 765,948 thalli; Max.: 4,919,328 thalli (2009–2011 survey; Campbell)	53,942 m^2
14c. Doon Hill/ W. of Aillebrack	> 300 thalli (1998 survey; Lockhart); 14 thalli (1999 survey; Holyoak); 18 thalli (2004 survey; Holyoak); 2 thalli (2006 survey; Holyoak)	8 m^2
15. Murvey Machair	30 thalli (1998 survey; Lockhart); 38 thalli (1999 survey; Holyoak); 101 thalli (2004 survey; Holyoak); 7 thalli (2006 survey; Lockhart)	1.75 m^2
16. Fanore	Min.: 116 thalli; Max.: 816 thalli (2009–2011 survey; Campbell)	35 m^2
17a. SW of Lough Naparka	5 thalli (1998 survey; Lockhart); 0 thalli (2003 survey; Hodgetts); 0 thalli (2006 survey; Lockhart)	0.25 m^2
17b. Magherabeg	Min.: 5,612 thalli; Max.: 14,590 thalli (2009–2011 survey; Campbell)	1,870.5 m^2
17c. Kilshannig	3 thalli (2003 survey; Hodgetts)	0.25 m^2
18a. Inch Spit	Min.: 92,364 thalli; Max.: 199,764 thalli (2009–2011 survey; Campbell)	7,160 m^2
18b. Rosbehy	20 thalli (2006 survey; Holyoak); 7 thalli (2012 survey; Lockhart)	43 m^2
19. West of Inny Ferry	*Circa* 50 thalli (1998 survey; Lockhart); 0 thalli (2009–2011 survey; Campbell)	0.5 m^2
20. North Bull Island	Min.: 25 thalli; Max.: 296 thalli (2009–2011 survey; Campbell)	37 m^2
21. Barley Cove	257 thalli (2012 survey; Lockhart)	109.4 m^2
Total	**Min.: 3,609,457 thalli; Max.: 15,097,303 thalli**	**339,604.3 m^2**

Because of the lack of historical population estimates, the considerable annual and seasonal (apparent) fluctuations in populations, and different count methodology used, it is almost impossible to assess population trends in individual colonies of *P. ralfsii* at this stage. The fact that there is a huge discrepancy between the estimated minimum and maximum totals is not surprising, considering the wide fluctuations that this species apparently undergoes, at least in terms of visible thalli.

Differences between counts may be largely attributable to the amount of search effort involved and the prevailing weather conditions around the time of search (N. Lockhart, pers. comm.). *P. ralfsii* is apparently much less frequent when the ground is dry and more frequent when it is damp. This may reflect temporary conditions, or a general reduction in the water table, possibly due to abstraction, or it may be an indication of the deleterious effects of climate change. In Cornwall, *P. ralfsii* has apparently increased in recent years (D. Holyoak, pers. comm.), and this may be as a result of climate change favouring the species.

Trends in the area covered by population (m^2) are also dependent on the presence of the species in order for it to be delimited. The number of localities however, should remain stable.

The Favourable Reference Population (FRP) is '*the population in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the species'* (Evans & Arvela, 2011). The area covered by population (m^2) calculated in the 2013 Conservation Assessment report to the EU is 339,600 m^2. Calculating the area covered by the population is dependent on the presence of *P. ralfsii*, which can undergo natural fluctuation depending on the prevailing conditions at the time of locality visits. At present, there are at least 30 *P. ralfsii* localities in the Republic of Ireland. This number of localities is considered adequate to ensure a Favourable Population conservation status in the future and is considered to represent the population baseline. As there is no evidence of any significant decline in locality number since the Directive came into force, the current area covered by population (m^2) and the number of localities is set as the Favourable Reference Population.

Following the General Evaluation Matrix for assessing the Conservation Status of Annex II Species (Evans & Arvela, 2011), because the Estimated Present Population is the same as the Favourable Reference Population, the Population Conservation Status of *P. ralfsii* in the Republic of Ireland is Favourable.

- **Species Population:** 30 localities of *P. ralfsii* (covering 339,600 m^2)
- **Favourable Reference Population:** 30 localities of *P. ralfsii* (covering 339,600 m^2)

Introduction to Habitat for the Species Assessment for *Petalophyllum ralfsii*

The extent and quality of suitable habitat is assessed to determine whether the long-term survival of the species is assured. The current area of habitat niche occupied by *P. ralfsii* is believed to be stable. Furthermore, the localities supporting *P. ralfsii*, several of which are large, are considered to be in good condition and are not considered under threat.

The habitat occupied by *P. ralfsii* has been mapped and visited by NPWS staff and other workers frequently in recent years. The extent of occurrence of 13 of the 30 localities studied by Campbell (2013) was measured by recording GPS co-ordinates along the perimeter of a polygon of the area containing *P. ralfsii*. The area covered by the population of *P. ralfsii* within the polygon was estimated,

as not all microhabitats within the polygon were suitable for *P. ralfsii*. Estimates based on expert judgement were derived for the remaining localities. The total national area covered by the population, i.e. Habitat for the species, was calculated at 339,600 m^2 or 33.96 hectares (see Table 2).

Habitat quality appeared good at all of the 13 localities visited in 2009–2011 (Campbell, 2013), apart from at one locality where *P. ralfsii* could not be refound, at West of Inny Ferry, Co. Kerry. It was given a poor rating mainly due to issues relating to grass cover and cover of bare ground linked to undergrazing. Limited data on habitat area and quality from NPWS bryophyte files compared with 2009–2011 data from the remaining 12 localities would suggest that there have been no losses in the area or quality of those localities in the recent past.

Overall, observations suggest that the dune slack and machair habitats that support *P. ralfsii* are still extensive and in good condition to support the species.

Therefore it was inferred that the conservation status for the 2007–2012 assessment of Habitat for the Species is Favourable.

From surveys carried out on 13 of the 30 localities in 2009–2011, habitat quality indicators were determined (Campbell, 2013) for assessment of Habitat for the Species for future assessments (see Section C).

Introduction to Future Prospects Assessment for *Petalophyllum ralfsii*

Any major impact of pressures (impacting activities) or threats (potential impacting activities in the foreseeable future) to the species survival are also identified and assessed to determine the Future Prospects.

Because of the fragility of its habitat and its specialised ecology, *P. ralfsii* is potentially threatened by a large number of factors, including holiday developments, recreational activities, removal of turf, under-grazing, desiccation due to water abstraction or afforestation and the spread of conifers. Having said that, many populations are found in good quality intact machair and dune slack systems and are recorded as having no perceived current pressures. The main threats can be summarised as follows:

- **Grazing imbalance**

  It is important to achieve the right balance of grazing in order to conserve *P. ralfsii*. A reduction in grazing by livestock and rabbits may threaten the plant at some localities, as it needs a short, open sward in order to compete. Any spread of coarser vegetation, because of a reduction in grazing, could constitute a threat to its survival. Scrub encroachment is also a problem, for example by *Hippophae rhamnoides*, a non-native species (Fossitt, 2000) which has occasionally been planted to stabilise sand dunes. Its dense shade supports only a much depleted ground flora (Ranwell, 1972). On the other hand, too high a level of grazing may have a deleterious impact on *P. ralfsii* through physical damage, soil erosion and an excessive input of nutrients.

- **Physical disturbance**

  Although it is likely that a small amount of disturbance, in the form of soil compaction, may be favourable to this plant, more extreme forms of disturbance, which break the bryophyte crust on the surface, are likely to be detrimental. Thus, a certain level of off-roading by vehicles may actually be beneficial, through providing wheel-ruts as habitat, but too much may destroy the integrity of the surface and threaten the plant. Some of the smaller populations are particularly at risk from disturbance events.

- **Pollution**

  Pollution of the groundwater, chiefly through eutrophication from agricultural activities such as slurry-spreading and application of fertilisers, is a threat to *P. ralfsii*. This appears to have eliminated it from Akeragh, Banna & Barrow Harbour, for example. Eutrophication may occur directly from over-stocking on the site, or it may be due to run-off from adjacent agricultural land. Dog faeces can be another source of local eutrophication. Pollution in the form of dumping may also be a threat. Many of the sites for this plant are prime sites for illegal dumping.

- **Turf-cutting and sand removal**

  Turf-cutting is an increasingly serious threat to some of the sites for *P. ralfsii*, as the tight grassy sward may appeal to some gardeners as a cost-free alternative to buying commercial turf to place in lawns or even on graves. Sand removal could easily destroy *P. ralfsii* habitat, as well as potentially disrupting the hydrology.

- **Desiccation & increase in salinity**

  General desiccation, as a consequence of climate change, drainage schemes or a lowering of the water table, is a very serious threat to *P. ralfsii*. This plant requires at least seasonal wetness, and if the number of days per year when the turf is wet reduces, then it is very noticeable that *P. ralfsii* is much reduced. Whether it disappears completely or retreats to its underground storage-organ is not known. Clearly *P. ralfsii* is well adapted to survive periods of desiccation as a dormant underground structure, but it is not yet known how much desiccation can be withstood before it disappears completely. An increase in salinity would also have an adverse effect on *P. ralfsii* – it may be somewhat salt-tolerant, as a predominantly coastal species, but flooding by sea water would probably eliminate it.

- **Land use**

  Large-scale changes in land use constitute perhaps the most significant threats to *P. ralfsii*. Dune systems are under constant pressure from proposed developments such as golf courses, caravan parks, hotel building and other leisure developments, all of which are capable of obliterating suitable habitat for this plant. It is likely that the Malahide locality has been destroyed in this way. Dune systems are occasionally regarded as good sites for conifer plantations, and these obviously destroy the fragile dune-slack habitat.

For the 2007–2012 assessment no pressures were recorded at 12 of the 13 localities studied during 2009–2011 (Campbell, 2013), nor at the remaining localities at the time of survey (NPWS submissions). Undergrazing was noted as an impacting pressure at the locality at West of Inny Ferry, Co. Kerry during 2009–2011, resulting in increased cover of grass and lack of bare ground, thus impacting on the quality of the habitat for *P. ralfsii* at that particular locality. As there is no evidence to suggest a change in grazing regime at the West of Inny Ferry site, undergrazing could be considered a threat at this particular site. However, this is an isolated occurrence it is a localised issue and does not represent the situation across the wider landscape. Therefore the Future Prospects for *P. ralfsii* were assessed as Favourable.

Introduction to Overall Conservation Status Assessment for *Petalophyllum ralfsii*

The overall assessment of each individual locality is derived from combining the results from each of the assessments (Population, Habitat for the Species and Future Prospects) to provide an Overall Conservation Condition rating of Favourable, Unfavourable – Inadequate or Unfavourable – Bad.

The proposed framework for assessing the conservation condition at a locality level allows for the amalgamation of results to assess conservation status at a national level, as required under Article 17 of the Habitats Directive. Evans & Arvela (2011) detail the approach that should be undertaken to assess conservation status at the national level.

The Range of *P. ralfsii* is not considered to have declined historically, or at least there is no evidence of a decline. It still occurs at the great majority of the localities from which it has been recorded. For the 2007–2012 assessment, as the Range of the species is the same as the Favourable Reference Range, it was allocated a Favourable conservation status.

The population of *P. ralfsii* in the Republic of Ireland is substantial, and appears to be fairly stable. However, long-term trends are at present difficult to distinguish from short-term fluctuations, and it may be that this species has declined, although there is no evidence for this, due to the paucity of fieldwork in the past. Therefore, for the 2007–2012 as the Population result is also the same as the Favourable Reference Population, Population was given an overall status of Favourable.

The habitat of *P. ralfsii*, dune slacks and machair, is still extensive and largely in good condition for *P. ralfsii* and the identified suitable areas still support *P. ralfsii*. Based on the surveys carried out in 2009–2011 (Campbell, 2013) undergrazing is a pressure at 1 of the 13 localities surveyed, but this is a localised issue and not considered to be impacting the population at a national level. For the 2007–2012 assessment therefore, Habitat for the Species therefore was given an overall status of Favourable.

Considering the impacts, pressures and threats to *P. ralfsii* in the Republic of Ireland today and the measures in place that will assist its protection, it is expected that this species will survive. Therefore for the 2007–2012 assessment, the status of Future Prospects of *P. ralfsii* is Favourable.

The Overall Conservation Status Assessment for *P. ralfsii* during the 2007–2012 reporting round was given a Favourable status as each of the parameters of Range, Population, Habitat for the Species and Future Prospects were given a status of Favourable.

Methodology for monitoring of *Petalophyllum ralfsii*

Broad-scale monitoring of *Petalophyllum ralfsii*

In order to accurately monitor the ecological health and conservation status of *P. ralfsii* localities on an on-going basis a two-tiered approach to monitoring is suggested, broad-scale and fine-scale monitoring.

The Joint Nature Conservation Committee (JNCC) consider monitoring to be a 'quick and dirty' exercise that can be done frequently, by non-specialists, to provide an early warning of designated features at localities slipping into an unfavourable conservation status. It does not require specialist knowledge of taxa, so tends to use a series of 'indirect attributes'. For example, a quick visit to a woodland to monitor the state of bryophytes might have to ascertain (a) that the trees have not been felled, (b) that the canopy structure is still more or less intact, and (c) that there is still a dominance of bryophytes on wet ground, rocks, banks and trees.

For *Petalophyllum ralfsii*, Table 3 (adapted by N. Hodgetts) might be a guide to broad-scale monitoring of the species (Hodgetts, 2007).

Table 3: Proposed guide to broad-scale monitoring of *Petalophyllum ralfsii* localities (Hodgetts, 2007).

Attribute	**Measure**	**Target**	**Comments**
Hydrology	Visual assessment	Very wet or inundated in winter; damp in summer	
Quantity*	Visual assessment	Estimate numbers (range, e.g. 1 – 10, 10 – 50, etc.) and general extent of area	No need to attempt precise count. It requires monitoring over a number of years to obtain an accurate picture of its abundance on a site.
Sward height	Visual assessment	< 1 cm with much bare ground	Associates: *Agrostis stolonifera*, *Festuca rubra*, *Plantago coronopus*, *Bellis perennis*, *Didymodon* spp. and *Barbula* spp.
Shade	Visual assessment	Shrubs and trees absent from sacks where *P. ralfsii* is known	Does not tolerate shading
Vegetation	Visual assessment	*Salix repens* and other coarse vegetation absent, or kept low by grazing	Does not tolerate competing vegetation such as *Salix repens*

* If able to identify *Petalophyllum ralfsii* confidently.

If one attribute fails, the locality is not in favourable condition. Broad-scale monitoring of this sort should be done annually at each *P. ralfsii* locality if possible, either by NPWS staff, other conservation professionals or volunteers.

Fine-scale monitoring of *Petalophyllum ralfsii*

In tandem with broad-scale monitoring, there should be a supporting programme of fine-scale monitoring. Fine-scale monitoring is considered to be an activity that is done mainly by specialists, and less frequently than broad-scale monitoring. It is recommended that fine-scale monitoring be carried out every six years, in accordance with the six-yearly reporting on the national conservation status of this Annex II species as required under Article 17 of the EU Habitats Directive (European Commission, 1992; Evans & Arvela, 2011).

As part of the field survey and monitoring of 13 *P. ralfsii* localities in 2009–2011, the above broad-scale monitoring guidelines (Table 3) were investigated and amended to provide more specific fine-scale monitoring guidelines. After analysis of the data, it was necessary to outline some small differences in the indicators monitored in machair habitat localities (Garter Hill, Doolough Machair, Dooyork Machair, North Inishkea, Doogort Machair, Keel Machair, Dooaghtry, Omey Island Machair, Mannin More, Truska Machair, Doon Hill/W. of Aillebrack and Murvey Machair) and those monitored in dune slack habitat localities (Rosses Strand, Rosepenna, Tramore/Black Burrow/SW of Dunfanaghy, Damph Beg, Derrybeg, Keadew Point, Dooey Point, Sheskinmore, Bunduff, Fanore, SW of Lough Naparka, Magherabeg, Kilshannig, Inch Spit, Rosbehy, West of Inny Ferry, North Bull and Barley Cove).

For *P. ralfsii*, fine-scale monitoring should consist of a visit to its localities by a bryologist, at least once every six years, to check (a) that *P. ralfsii* is still present, and (b) to assess the health and extent of its population, habitat and associated species. Naturally, the fine-scale monitoring visit should double as a broad-scale monitoring visit.

Each locality should be visited and assessed using the 'Locality Survey Card' (see Table 4 & Appendix I) and Assessment sheets (see Tables 5–7 & Appendix I) and digital photographs should be taken, so that future monitoring can be compared with the baseline data collected in 2009–2011 (Campbell, 2013) and from other NPWS surveys.

Each locality assessment comprises a Population Assessment, Habitat for the Species Assessment, Future Prospects Assessment and Overall Conservation Condition Assessment.

Preparation for fine-scale monitoring visit

Prior to the fine-scale monitoring being carried out, the surveyor should ensure that they have the necessary skills to identify *P. ralfsii*, including its reproductive structures and information on species it may be confused with, e.g. *Fossombronia* spp. and *Moerckia flotoviana*. Identification of associate species should also be included in preparation, particularly of associated bryophyte species such as *Aneura pinguis*, *Bryum pseudotriquetrum* and *Didymodon fallax*. The surveyors must also ensure that they have a licence from NPWS that allows them to visit *P. ralfsii* localities and collect material for identification/verification purposes if necessary.

A thorough familiarisation with previous surveys of and monitoring visits to the localities under investigation is also required as this will highlight any changes in status or threats from the previous visits.

Field survey equipment should include:

- An adequate number of Locality Survey Cards and Assessment sheets (Appendix I)
- Maps and GPS points showing location of populations (Appendix II & see Appendix III)
- A handheld GPS receiver capable of differential corrections accurate to 50 cm or less with post processing (e.g. Trimble GeoExplorer range)
- Large pointed sticks (white, or another clearly visible colour)
- 1 x 1 m quadrat
- Hand lens (x 10+)
- Trowel
- Ruler & measuring tape
- Digital camera
- Compass
- Cocktail sticks for marking thalli locations within plots
- Collection bags/envelopes/packets
- Plant identification guides (e.g. Atherton *et al*., 2010)

The timing of visits should occur in spring as thalli are most likely to be visible above ground at that time of year. Sporophytes are also most likely to be observed at that time of year (Paton, 1999), which can give an indication of the reproductive viability of the population at the particular locality. Presence of sporophytes can also be an indication that enough water is present for fertilisation to occur. Groundwater levels are more likely to be higher then also.

All questions on the field survey sheets should be filled in on-site to the best ability of the surveyor. The aim is to record the extent and status of the liverwort and any pressures or threats on an individual locality basis. It is recommended that the recording sheets containing the previous monitoring results be compared in the field with the latest monitoring results. This will enable the surveyor to ascertain if any changes have taken place between surveys.

Locality Survey Card and Assessment sheets

During each fine-scale monitoring visit, a Locality Survey Card is completed (see Appendix I) which includes information on 1 x 1 m plots to be recorded. The data from these are then used to complete the Assessment sheets (Appendix I) for each locality which comprises the Population Assessment, Habitat for the Species Assessment and Future Prospects Assessment, full details of which are set out in Sections A–C below. The combined data allows for the Overall Conservation Condition Assessment of each locality to be determined, i.e. Favourable, Unfavourable – Inadequate, Unfavourable – Bad (Section D). From the individual locality Condition Assessments a national Overall Conservation Status can be derived (Section E).

Extent of occurrence, area of occupancy and area covered by the population

The first thing to be carried out during a fine-scale monitoring visit is to determine the extent of occurrence and area of occupancy (in m^2) of *P. ralfsii* within the locality. The methodology for mapping the extent of occurrence at both machair and dune slacks localities is the same. The extent of occurrence of *P. ralfsii* should be marked by white plastic sticks for easy visualisation. Once the extent of occurrence is delimited the points should be recorded on a handheld GPS. A polygon can subsequently be drawn around these points and the area measured using GIS software such as ArcGIS to define the area of occupancy (m^2). An on-site estimation should be made of the percentage of the area covered by the population, i.e. the area of suitable habitat within which *P. ralfsii* actually occurs, within the area of occupancy and noted on the Locality Survey Card (see Table 4 for a Locality Survey Card filled out with details of the locality at Bunduff for an example).

1 x 1 m plots for Population Assessment and Habitat for the Species Assessment

It is suggested that within the smaller dune slack and machair localities, two to three 1 x 1 m plots should be randomly located within the area covered by the population, and four to five 1 x 1 m plots be recorded in larger dune slack and machair localities. The presence of *P. ralfsii* within the plot should be ensured. If *P. ralfsii* is not present, another random point should be chosen until *P. ralfsii* is found within the plot. The microhabitats in the extensive machair localities are highly variable and include very wet areas unsuitable for *P. ralfsii*. At some localities, e.g. Magherabeg, the species may occur only on the sides of low sandy hummocks, so the nearest hummock to a randomly chosen point should be searched for its presence, then the next randomly located hummock, etc. Once presence of *P. ralfsii* in the plot is confirmed the Locality Survey Card (see Appendix I) can be filled out for each of the two to five plots.

In the case where no thalli can be found at the locality, the plots can be positioned on spots where GPS co-ordinates marking *P. ralfsii* thalli were previously recorded (see Appendix III) to ensure that the habitat is still suitable. The Locality Survey Card can still be filled out, excluding details on thalli numbers. The GPS positions of plots containing *P. ralfsii* recorded during the 2009–2011 survey for 12 of the populations (Campbell, 2013) can be used (see Appendix III) to position plots.

Parameters to be recorded in 1 x 1 m plots

The following parameters should be recorded in each 1 x 1 m plot:

- The GPS co-ordinates and altitude (in metres above sea level (m.s.l.)) of each plot should be recorded on the hand-held GPS device and also noted on the Locality Survey card.
- A hole should be dug beside the 1 x 1 m plot with a trowel until the groundwater level is reached. Groundwater should be allowed to accumulate in the hole until the level becomes stable. The distance from the groundwater level to the soil surface (cm) should then be measured with a ruler/measuring tape. If bedrock is hit before reaching the groundwater level then the depth (cm) to the bedrock from the surface of the soil should be measured with a ruler/measuring tape and noted.
- Each individual *P. ralfsii* thallus should be marked with a cocktail stick. The search for thalli in each plot should be at least 30 minutes in duration. Once all thalli are marked, they should be counted by their reproductive status (male, female, indeterminate, with mature or immature sporophytes). This is in order to amass information on the viability of the population.
- The mean vegetation height (cm) should be calculated by averaging the length of 5 stems in the plot measured with a ruler/measuring tape.
- Shrub cover and grass cover should be recorded to the nearest 5% within each 1 x 1 m plot.
- The cover of bare ground within each 1 x 1 m plot should be estimated to the nearest 1%.
- Photographs should be taken of each plot facing north, south, east and west and a final one from above to give an overview of the plot.
- Any associated species within the plot should be noted.

Table 4 shows an example of a completed Locality Survey Card for Bunduff, Co. Sligo.

Table 4: Locality survey card for *Petalophyllum ralfsii* fine-scale monitoring filled out for Bunduff, Co. Sligo

Locality name: Bunduff	**Surveyor:** C. Campbell	**Date:** 30/03/2009
County (vice): Sligo (H28)	**Aerial Photo ID:** 00711-D (2005)	**Seasonal flooding evident (✓):** ✓
SAC: Bunduff Lough and Machair/ Trawalua/ Mullaghmore (SAC code: IE000625)	**Discovery Series OS Map No.:** 16	
Extent of occurrence mapped (✓): ✓	**% of extent covered by population:** 80%	**Time spent on site:** 5 hours
Brief site description: The population here occurs on a track at the eastern edge of a dune slack *circa* 22 m long and 1.5-2 m wide, covering an area of *ca.* 24 m². The main area of the slack is very wet with standing water present and a dominance of *Calliergonella cuspidata*. Three plots recorded along the track on a sandy loam *ca.* 2-3 cm deep above pure sand.		
Details of pressures/threats noted (including photos, GPS, etc.): The area appears grazed by cattle and rabbits and so a potential threat would be any change to this regime.		
Other notes:		

Plot (1 x 1 m) Number:	**1**	**2**	**3**	**4**	**5**
Hole dug for groundwater level (✓):	✓	✓	✓	-	-
GPS co-ordinates:	G70725 56233	G70721 56246	G70720 56256	-	-
Altitude (m.s.l.):	3	2.5	2.3	-	-
Mean vegetation height (cm) (mean height of 5 stems):	2.8	3.2	2.5	-	-
Shrub cover (to nearest 5%):	0	0	0	-	-
Grass cover (to nearest 5%):	40	25	30	-	-
Cover of bare ground (to nearest 1%):	6	7	4	-	-
Total number of thalli:	5	2	4	-	-
Number of indeterminate thalli:	1	2	4	-	-
Number of male thalli:	1	0	0	-	-
Number of female thalli:	3	0	0	-	-
Number of immature sporophytes:	0	0	0	-	-
Number of mature sporophytes:	0	0	0	-	-
Photo ID (N,S,E,W, overview):	P1-P5	P6-P10	P7-P15	-	-
Groundwater level depth (cm):	-33	-26	-18	-	-

Species present (✓)	**1**	**2**	**3**	**4**	**5**	**Species present (✓)**	**1**	**2**	**3**	**4**	**5**
Anthoxanthum odoratum	✓										
Bellis perennis	✓										
Carex flacca	✓	✓	✓								
Equisetum variegatum	✓	✓	✓								
Festuca rubra	✓	✓	✓								
Hieracium pilosella	✓		✓								
Leontodon autumnalis	✓	✓	✓								
Lotus corniculatus	✓	✓	✓								
Plantago coronopus			✓								
Prunella vulgaris		✓	✓								
Ranunculus bulbosus	✓	✓									
Sagina nodosa	✓										
Thymus praecox	✓	✓	✓								
Trifolium repens	✓	✓	✓								

Section A – Population Assessment

'Area covered by the population (m^2)' is an accepted method of assessing populations of bryophytes (Evans & Arvela, 2011) as it can be difficult to determine what constitutes an individual because of the clonal nature of many species (Hallingbäck *et al*., 1998). It is also used to assess the parameter of area of 'Habitat for the Species' in the EU Conservation Assessment report.
Thus both area covered by the population (m^2) and thalli counts are to be assessed. The overall aim of these approaches is to generate a set of standardised and comparable data that can be used to determine trends in the cover and number of thalli of the species.

The area of the polygon around the plotted GPS of the extent of occurrence within the locality should be calculated, i.e. area of occupancy, and entered in the Population Assessment table (see Table 5 & Appendix I). An estimate of the percentage of the area of occupancy covered by *P. ralfsii* should also be taken from the Locality Survey Card and entered in the Population Assessment table (see Table 5 & Appendix I). The area covered by the population (m^2) can then be calculated. No specific target value for area covered by the population (m^2) should be set as this number is variable from year to year. Information collected over a number of years of monitoring will build up a picture of the species abundance at a locality (Hodgetts, 2000) and trends should be assessed over the monitored years to determine any patterns of decline and also in relation to other parameters recorded.

Due to the natural variability of the occurrence and density of *P. ralfsii*, targets involving thalli numbers cannot be set. Therefore the confirmation of the presence of the species at the locality is the sole target result to achieve a Favourable Population Assessment (Green). In the case that the species cannot be found during the survey period and the Assessments for Habitat for the Species is given a Favourable status, then Population can be also be given a Favourable status. In the case that the species cannot be found during the survey period and the Assessments for Habitat for the Species is given an Unfavourable – Inadequate status, then Population can be also be given an Unfavourable – Inadequate status. If *P. ralfsii* cannot be found during the survey period and the Assessments for Habitat for the Species is given an Unfavourable – Bad status, then Population can be also be given an Unfavourable – Bad status.

If, after three cycles of 6-yearly monitoring, the species is still not found at a specific locality (taking into account time of year, the prevailing weather conditions around the time of search, etc.) then it is to receive an Unfavourable - Inadequate status (Amber). It cannot be said for certain that the species is extinct at the locality, especially if the Habitat for the Species Assessment is Favourable, but more search effort should be inputted in this case.

The Population Assessment table on the recording sheet should be filled in for each locality visited (see Appendix I). Table 5 shows an example of Population Assessment table filled out for Bunduff (a dune slack locality).

Table 5: Example *Petalophyllum ralfsii* Population Assessment table filled out for Bunduff, Co. Sligo.

Area of occupancy (m²)		**% covered by *P. ralfsii***	**Area covered by *P. ralfsii* (m²)**	**Mean no. of thalli in 1 x 1 m plots**	**Population estimation (thalli numbers)**
Area of polygon around GPS points marking extent of occurrence of *P. ralfsii*	55.03	80%	44.02	3.7	163 thalli

Population Assessment result	**Result (✓)**	**Condition**
Thalli present	✓	Favourable
Thalli not present & Habitat for the Species Assessment is Favourable		Favourable
Thalli not present & Habitat for the Species Assessment is Unfavourable - Inadequate		Unfavourable - Inadequate
Thalli not present & Habitat for the Species Assessment is Unfavourable - Bad		Unfavourable - Bad
Thalli not present for 3 consecutive monitoring cycles		Unfavourable - Inadequate

Section B – Habitat for the Species Assessment

Floristic work on the habitats of *P. ralfsii* by Campbell (2013) suggested positive and negative indictors to monitor. The indicators used to assess habitat quality are hydrology, shrub cover, grass cover, cover of bare ground and mean vegetation height. These should be recorded within the two–five 1 x 1 m plots and data entered on the Locality Survey Card (see Table 6 & Appendix I). Details, including GPS positions and photographs, of any pressures (e.g. illegal dumping) or other features of interest should be noted on the Locality Survey Card also. Potential threats should also be noted.

From the parameters recorded on the Locality Survey Card, the Habitat Assessment table (see Table 6 & Appendix I) can be filled out and the indicators assessed.

The indicators and how to assess them are outlined below.

Hydrology

The timing of locality visits is suggested as spring. Pools of surface water visible in lower lying parts of the site should be noted. The groundwater level should be recorded at the two-five random plot locations. This is done by digging a hole with a trowel just outside the plot until the groundwater level is reached. The groundwater level should be allowed to settle for at least 30 minutes while the thalli count is being assessed. Once the level is stable, the depth from the top of the hole to the level should be measured with a ruler or a measuring tape.

It is suggested here that the mean groundwater level should not reach below 80 cm from the ground surface. At localities where the groundwater table cannot be measured due to underlying rock, indeed, at all localities, the surface of the soil should be wet or at least damp to the touch when a hand is pressed into the soil.

Shrub (*Salix repens*) cover

Shrub cover should be monitored as *P. ralfsii* does not tolerate excessive shading. Shrub cover, in particular *Salix repens*, within each 1 x 1 m plot should be estimated to the **nearest 5%**. Mean shrub cover averaged over all the plots should not exceed 25%.

Grass cover

Increased nutrients and/or undergrazing can change the vegetation composition; tall herbs and grasses can begin to dominate. Grass cover should be estimated to the **nearest 5%** within each plot and mean grass cover averaged over all plots should not exceed 60%.

Cover of bare ground

Some bare ground should be present as too closed a sward could out-shade and out-compete *P. ralfsii*. Cover of bare ground should be estimated to the **nearest 1%** in each plot. Mean cover of bare ground should exceed 5% averaged over all plots.

Mean vegetation height

The height of 5 stems in each 1 x 1 m plot should be measured with a ruler/ measuring tape and averaged per plot. The mean vegetation height averaged over the monitoring plots in the machair localities, should not exceed 6 cm, and in the dune slack localities, should not exceed 9 cm.

The Habitat Assessment table on the assessment sheet (see Appendix I) should be filled out for each locality. For the Habitat for the Species Assessment, to indicate favourable or unfavourable conditions the following criteria should be used:

- 4–5 passes = Favourable (Green),
- 2–3 passes = Unfavourable - Inadequate (Amber), and
- 0–1 passes = Unfavourable - Bad (Red).

Table 6 shows an example of a completed Habitat for the Species Assessment table for Bunduff, a dune slack locality, in Co. Sligo.

Table 6: Completed Habitat for the Species Assessment sheet for Bunduff, Co. Sligo.

Indicator	Method of assessment	Target	Result	Pass/Fail
Hydrology ☑ **Tick box if surface water present on site**	Measuring depth to groundwater level in hole	≤ 80 cm depth from ground surface	25.7 cm from ground surface	Pass
	If bedrock below: Hand should be pressed onto soil surface	Soil surface should be wet/damp	(Soil surface damp)	(Pass)
Shrub cover	Estimation of shrub cover to nearest 5% in each of 2-5 plots	Mean percent shrub cover should **not** exceed 25%	0%	Pass
Grass cover	Estimation of grass cover to nearest 5% in each of 2-5 plots	Mean percent grass cover should **not** exceed 60%	35%	Pass
Cover of bare ground	Estimation of cover of bare ground to nearest 1% in each of 2-5 plots	Mean percent cover of bare soil should exceed 5%	7.6%	Pass
Mean vegetation height	Mean height (cm) of 5 stems per plot averaged in 2-5 plots	Machair: Mean vegetation height should **not** exceed 6 cm	NA	NA
		Dune slack: Mean vegetation height should **not** exceed 9 cm	3.8 cm	Pass
Habitat for the Species Assessment:			**Result**	**Condition**
Favourable (Green): 4 – 5 passes Unfavourable – Inadequate (Amber): 2 – 3 passes Unfavourable – Bad (Red): 0 – 1 passes			5 passes	Favourable

Section C - Assessment of Future Prospects

The Future Prospects Assessment table contains sections to record current pressures and potential threats to the species at each locality. Impacting activities are considered to be pressures if they are currently negatively impacting the species and are considered threats if they are likely to impact the species in the foreseeable future (foreseeable future is taken to be 12 years, i.e. the length of two reporting rounds (Evans & Arvela, 2011)). Not all impacting activities are negative and some may have a positive impact on the species. Continued and standardised assessment of the local threat status will be important in monitoring trends over time, and will ultimately help inform management decisions. The future prospects of *P. ralfsii* are believed to be stable in the short/medium term.

Impacting activities should be recorded using the standardised EU-devised list of impacts and their codes (Ssymank, 2010). Activities and their location (either within or outside the extent of occurrence), influence (positive, negative or neutral), intensity (high, medium or low) and area affected (0 – 10 m^2,

11 – 50 m^2, 51 – 100 m^2 or > 100 m^2) should also be recorded (see Table 7 & Appendix I). If the influence of, the intensity of or the area affected by the impact cannot be measured, or if there is no current impact, then 'Unknown' can be filled in for influence, intensity and area affected. Again, this is to highlight any potential issues that may arise based on the impacting activity and allows for such pressures and threats to be monitored at future visits to the localities.

The assessment of Future Prospects is more subjective. If there is no significant impact of the activities the Future Prospects should be assessed as Favourable, moderate impact should be assessed as Unfavourable - Inadequate and severe impact as Unfavourable - Bad. For localities where there are more than one impacting activity recorded, if any of the impacting activities are having a moderate impact, the overall Future Prospects assessment is 'Unfavourable – Inadequate' for that population. Similarly, if any of the impacting activities are having a severe impact on an individual locality, the overall Future Prospects assessment is recorded as 'Unfavourable – Bad' for that locality.

Table 7: Future Prospects Assessment Potential of impacting activities (with their EU code) with location, influence, intensity and area affected for *Petalophyllum ralfsii* localities Future Prospects Assessment. Example from Bunduff, Co. Sligo.

Activity (EU code)	**Pressure (P) or Threat (T)***	**Location (Inside/ outside extent of occupancy)**	**Influence (Positive/ Negative/ Neutral)**	**Intensity (High/ Medium/ Low)**	**Area affected (0-10 m²; 11-50 m²; 51-100 m²; > 100 m²)**
Intensive grazing (A04.01)					
Excessive poaching (trampling, overuse; G05.01)					
Abandonment of pastoral systems, lack of grazing (A04.03)	T	Inside & outside	Negative	Low	11-50 m²
Stock feeding (A05.02)					
Restructuring agricultural land holdings (A10)					
Fertilisation (A08)					
Pollution to groundwater (H02)					
Water abstractions from groundwater (J02.07)					
Sand & gravel extraction (C01.01)					
Motorised vehicle damage (G01.03)					
Other outdoor sports & leisure activities (G01.08)					
Sport & leisure structures (G02)					
Dumping (Discharges E03)					
Invasive non-native species (I01)					
Natural erosion (K01.01)					
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)					
Species composition change (succession) (K02.01)					
Other:					

Future Prospects Assessment:	**Result**	**Condition**
Favourable (Green): No significant impact Unfavourable – Inadequate (Amber): Moderate impact Unfavourable – Bad (Red): Severe impact	Not significant	Favourable

*Pressure (P) – activity currently impacting the species or habitat; Threat (T) – activity likely to impact the species or habitat.

Section D – Assessing Overall Conservation Condition at the individual localities

To complete an Overall Conservation Condition Assessment for each individual locality the Population, Habitat and Future Prospect Assessments (see Tables 5, 6 & 7) are combined to derive and an overall rating of Favourable, Unfavourable - Inadequate or Unfavourable - Bad.

Targets for Population, Habitat for the Species and Future Prospects should be assessed at a locality - by-locality level. The raw data for each locality assessment can then be used to derive a national Conservation Status assessment.

The Overall Conservation Condition of each locality is carried out by combining the results from all the other assessments and is assessed using the following criteria.

- All Favourable = Favourable
- 1 – 3 Unfavourable - Inadequate = Unfavourable - Inadequate
- 1 Unfavourable - Bad = Unfavourable - Bad

Table 8 shows an example of a completed Overall Conservation Condition Assessment for Bunduff.

Table 8: Example of an Overall Conservation Condition Assessment for the locality at Bunduff, Co. Sligo.

Parameter	**Assessment**
Population	Favourable
Habitat for the Species	Favourable
Future Prospects	Favourable
Overall Conservation Condition of the locality	Favourable

Section E – Assessing Overall Conservation Status for Petalophyllum ralfsii in the Republic of Ireland

The Overall Conservation Status for the Republic of Ireland is derived by combining the results from each of the individual locality Conservation Condition assessments and extracting details on population numbers, habitat quality and also impact of threats/pressures using the criteria set out in Table 9. However, expert judgement should be used when assessing these criteria, e.g. where there is a localised issue that is not considered a pressure or threat at a national level, this pressure or threat should be highlighted for that locality, but may not necessarily reflect a negative impact on the national conservation status.

The 13 of 30 localities visited in the 2009–2011 study (Campbell, 2013) are a representative sample across the natural range of the species in the Republic of Ireland. It is recommended that all 30 localities be visited to ensure accurate values for Range and Population are being reported. Any locality that is lost since the Directive came into force will result in a downgrading of the Population parameter to 'Unfavourable – Inadequate' or 'Unfavourable – Bad' following the rules-based approach

in Evans & Arvela (2011). Absence of thalli cannot be taken in isolation as evidence that the population is lost (see Section A) due to the huge variability in presence and numbers of thalli appearing above ground at any given time. If, however, after three reporting cycles, no thalli have been recorded at a particular locality then more recording effort must be expended before it can be said for certain the population is extinct (see Section A) and a downgrading of Population conservation status is given.

Range may also be affected by any population losses, although this will depend where the population is located. Any new discoveries of *P. ralfsii* localities may result in an adjustment of Favourable Reference Values. New discoveries are likely to be populations that were overlooked rather than an expansion of the Range, especially due to the ephemeral nature of the species.

There is likely to be adequate habitat of sufficient quality for *P. ralfsii* in the Republic of Ireland. The Habitat for the Species conservation condition assessment for the localities should be combined and considered at a national level to assess if the overall status is Favourable. If an Unfavourable – Inadequate condition is given to 3 to 5 of the localities (10%+), then the overall status for 'Habitat for the Species' should be given an Unfavourable – Inadequate status. If 3 or more localities (10%+) are given an Inadequate – Bad condition then an overall conservation status for Habitat for the Species of 'Unfavourable – Bad' must be given.

The list of pressures reported for each locality should be amalgamated to determine whether there are any pressures that are being repeatedly observed and at an intensity that is resulting in a decline in Population or Habitat for the Species. The severity of the impact will determine whether to assess as Unfavourable – Inadequate or Unfavourable – Bad overall. It is recommended that the impact of pressures be taken into account over the six years of the reporting period and threats be assessed for twelve years into the furture (two reporting periods). Table 9 shows the ranking of the relative importance of any pressure or threat evident at the localities (taken from Evans & Arvela, 2011).

Table 9: Ranking of importance of threats/pressures.

Code	Importance	Comment
H	High importance/impact	Important direct or immediate influence and/or acting over large areas
M	Medium importance/impact	Medium direct or immediate influence, mainly direct influence or acting over moderate part of the area/acting only regionally
L	Low importance/impact	Low direct or immediate influence, indirect influence and/or acting over small part of the area/acting only regionally

Based on the surveys carried out in 2009–2011 (Campbell, 2013) undergrazing is a pressure at 1 of the 13 localities surveyed, but this is a localised issue and not considered to be impacting the *P. ralfsii* population at a national level.

The Overall Conservation Status is discerned by combining the results from all the other national assessments (Range, Population, Habitat for the Species and Future Prospects) and is assessed using the following criteria:

- All Favourable (Green) = Favourable (Green)
- 1–4 Unfavourable - Inadequate (Amber) = Unfavourable - Inadequate (Amber)
- 1 Unfavourable - Bad (Red) = Unfavourable - Bad (Red).

If an individual parameter is given an Unfavourable status, the assessment should be qualified to indicate if the status is improving, stable , declining or unknown by adding a plus, equal, minus or 'x' respectively. The qualifier should be based on trends over the reporting period that are expected to continue (Evans & Arvela, 2011). If the Overall Conservation Status assessment is Unfavourable this should also have a qualifier to indicate the overall trend, for example a status of 'Unfavourable – Inadequate +' would mean although the status is Unfavourable, it is improving.

Conclusion

The present Overall Conservation Status of *Petalophyllum ralfsii* in the Republic of Ireland is Favourable. Future monitoring and reporting to the European Commission will ensure that this status will be examined every 6 years and maintained, as action can be taken to safeguard against any changes to the status through early intervention. Further accurate monitoring will also provide information on long-term population trends of this colonist species.

It has been suggested that the relatively large (40–56 μm) spores may persist in the soil for long periods until environmental conditions become suitable for new plant production (Sim-Sim *et al*., 2000). Empirical studies on the longevity of *P. ralfsii* spores and also their dispersal capacity would provide further information on the chances of survival of the populations. Study of the longevity of *P. ralfsii* spores and also their dispersal capacity would elucidate how likely a return of *P. ralfsii* to the West of Inny Ferry locality would be if suitable conditions were re-established.

Allozyme analysis of populations of *P. ralfsii* in Great Britain did not reveal any genetic diversity within or among populations (Rumsey *et al*., 2000). However, analysis using DNA fingerprinting techniques such as amplified fragment length polymorphism (AFLP) would be more informative in providing an assessment of genetic diversity within the Irish population. Pre-screening for endophytic fungal contaminants would be required however (Duckett *et al*., 2006; Fernandez *et al*., 2006). For example, AFLP analysis of the sole east coast locality at Bull Island will elucidate if this population is genetically distinct from the west coast populations as its geographic location would suggest. Genetic fingerprinting data would also inform locality conservation priorities.

As the Republic of Ireland is a stronghold for *P. ralfsii* and currently maintains the largest populations in Europe, it has a European, as well as international, obligation to monitor and conserve the species.

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Appendix I – Locality Survey Card & Assessment sheets

This appendix contains the Locality Survey Card to be filled out on a visit to each particular locality. It also contains the Assessment sheets to be filled out for each locality.

As there is a slight difference between one of the Habitat for the Species indicators (i.e. mean vegetation height) to be monitored for machair localities and dune slack localities, it is therefore necessary to differentiate between major habitat types for each *P. ralfsii* locality as follows:

1. Rosses Strand, Co. Donegal – Dune slack locality
2. Rosepenna, Co. Donegal – Dune slack locality
3. Tramore/Black Burrow/SW of Dunfanaghy, Co. Donegal – Dune slack locality
4a. Damph Beg, Co. Donegal – Dune slack locality
4b. Derrybeg, Co. Donegal – Dune slack locality
4c. Keadew Point, Co. Donegal – Dune slack locality
5a. Dooey Point, Co. Donegal – Dune slack locality
5b. Sheskinmore, Co. Donegal – Dune slack locality
6. Bunduff, Co. Sligo – Dune slack locality
7. Garter Hill, Co. Mayo – Machair locality
8a. Doolough Machair, Co. Mayo – Machair locality
8b. Dooyork Machair, Co. Mayo – Machair locality
9. North Inishkea, Co. Mayo – Machair locality
10. Doogort Machair, Co. Mayo – Machair locality
11. Keel Machair, Co. Mayo – Machair locality
12. Dooaghtry, Co. Mayo – Machair locality
13. Omey Island Machair, Co. Galway – Machair locality
14a. Mannin More, Co. Galway – Machair locality
14b. Truska Machair, Co. Galway – Machair locality
14c. Doon Hill/W. of Aillebrack, Co. Galway – Machair locality
15. Murvey Machair, Co. Galway – Machair locality
16. Fanore, Co. Clare – Dune slack locality
17a. SW of Lough Naparka, Co. Kerry – Dune slack locality
17b. Magherabeg, Co. Kerry – Dune slack locality
17c. Kilshannig, Co. Kerry – Dune slack locality
18a. Inch Spit, Co. Kerry – Dune slack locality
18b. Rosbehy, Co. Kerry – Dune slack locality
19. West of Inny Ferry, Co. Kerry – Dune slack locality
20. North Bull, Dublin – Dune slack locality
21. Barley Cove, Co. Cork – Dune slack locality

Locality survey card for *Petalophyllum ralfsii* fine-scale monitoring

Locality name:	**Surveyor:**	**Date:**
County (vice):	**Aerial Photo ID:**	**Seasonal flooding evident (✓):**
SAC:	**Discovery Series OS Map No.:**	
Extent of occurrence mapped (✓):	**% of extent covered by population:**	**Time spent on site:**
Brief site description:		
Details of pressures/threats noted (including photos, GPS, etc.):		
Other notes:		

Plot (1 x 1 m) Number:	**1**	**2**	**3**	**4**	**5**
Hole dug for groundwater level (✓):					
GPS co-ordinates:					
Altitude (m.s.l.):					
Mean vegetation height (cm) (mean height of 5 stems):					
Shrub cover (to nearest 5%):					
Grass cover (to nearest 5%):					
Cover of bare ground (to nearest 1%):					
Total number of thalli:					
Number of indeterminate thalli:					
Number of male thalli:					
Number of female thalli:					
Number of immature sporophytes:					
Number of mature sporophytes:					
Photo ID (N, S, E, W, overview):					
Groundwater level depth (cm):					

Species present (✓)	**1**	**2**	**3**	**4**	**5**	**Species present (✓)**	**1**	**2**	**3**	**4**	**5**

Population Assessment for _____ Date: _____

Area of occupancy (m²)		**% covered by *P. ralfsii***	**Area occupied by *P. ralfsii* (m²)**	**Mean no. of thalli in 1 x 1 m plots**	**Population estimation (thalli numbers)**
Area of polygon around GPS points marking extent of occurrence of *P. ralfsii*					

Population Assessment Result	**Result (✓)**	**Condition**
Thalli present		Favourable
Thalli not present & Habitat for the Species Assessment is Favourable		Favourable
Thalli not present & Habitat for the Species Assessment is Unfavourable - Inadequate		Unfavourable - Inadequate
Thalli not present & Habitat for the Species Assessment is Unfavourable - Bad		Unfavourable - Bad
Thalli not present for 3 consecutive monitoring cycles		Unfavourable - Inadequate

Habitat for the Species Assessment for _____

Indicator	**Method of assessment**	**Target**	**Result**	**Pass/Fail**
Hydrology ☐ **Tick box if surface water present on site**	Measuring depth to groundwater level in hole	≤ 80 cm depth from ground surface		
	If bedrock below: Hand should be pressed onto soil surface	Soil surface should be wet/damp		
Shrub cover	Estimation of shrub cover to nearest 5% in each of 2–5 plots	Mean percent shrub cover should **not** exceed 25%		
Grass cover	Estimation of grass cover to nearest 5% in each of 2–5 plots	Mean percent grass cover should **not** exceed 60%		
Cover of bare ground	Estimation of cover of bare ground to nearest 1% in each of 2–5 plots	Mean percent cover of bare soil should exceed 5%		
Mean vegetation height	Mean height (cm) of 5 stems per plot averaged in 2–5 plots	**Machair**: Mean vegetation height should **not** exceed 6 cm		
		Dune slack: Mean vegetation height should **not** exceed 9 cm		

Habitat for the Species Assessment:	**Result**	**Condition**
Favourable: 4 – 5 passes Unfavourable – Inadequate: 2 – 3 passes Unfavourable – Bad: 0 – 1 passes		

Assessment of Future Prospects for _____

Activity (EU code)	**Pressure (P) or Threat (T)***	**Location (Inside/ outside extent of occupancy)**	**Influence (Positive/ Negative/ Neutral)**	**Intensity (High/ Medium/ Low)**	**Area affected (0-10 m^2; 11-50 m^2; 51-100 m^2; > 100 m^2)**
Intensive grazing (A04.01)					
Excessive poaching (trampling, overuse; G05.01)					
Abandonment of pastoral systems, lack of grazing (A04.03)					
Stock feeding (A05.02)					
Restructuring agricultural land holdings (A10)					
Fertilisation (A08)					
Pollution to groundwater (H02)					
Water abstractions from groundwater (J02.07)					
Sand & gravel extraction (C01.01)					
Motorised vehicle damage (G01.03)					
Other outdoor sports & leisure activities (G01.08)					
Sport & leisure structures (G02)					
Dumping (Discharges E03)					
Invasive non-native species (I01)					
Natural erosion (K01.01)					
Biocenotic evolution, succession (incl. enlargement of scrub vegetation area) (K02)					
Species composition change (succession) (K02.01)					
Other:					

Future Prospects Assessment:	**Result**	**Condition**
Favourable: No significant impact Unfavourable – Inadequate: Moderate impact Unfavourable – Bad: Severe impact		

*Pressure (P) – activity currently impacting the species or habitat; Threat (T) – activity likely to impact the species or habitat.

Overall Conservation Condition Assessment for _____

Parameter	Assessment
Population	
Habitat for the Species	
Future Prospects	
Overall Conservation Condition	

Additional comments:

Appendix II – Individual locality details

This section contains information for each of the 30 *Petalophyllum ralfsii* localities in the Republic of Ireland comprising previous survey details, overview Discovery maps highlighting the location of the localities and aerial photographs highlighting GPS location of records.

Tranarossan and Melmore Lough SAC (IE000194)

Locality No. 1: Rosses Strand, Co. Donegal; Grid ref. C118428

Field notes from David Holyoak (25 May 2002):

15 thalli at C11864282, near north end of Rosses Strand, on unshaded, partly bare, damp sand exposed in gaps and a small path on south-facing hillside above sandy bay; on slopes of 10–30°, amongst short (< 5 cm) herb-rich grassland. Area closely grazed by sheep.

Field notes from Neil Lockhart (8 May 2006):

Habitat looks as described, but failed to find *P. ralfsii* at place described, perhaps because of dry weather. However, 2 thalli found at C11864280, slightly to the east of D. Holyoak's 2002 record.

Associates:

Agrostis stolonifera
Amblystegium serpens var. *salinum*
Aneura pinguis
Barbula convoluta
Bellis perennis
Bryum pseudotriquetrum
Carex flacca
Carex panicea
Ctenidium molluscum
Cynosurus cristatus
Distichium inclinatum
Ditrichum gracile
Festuca rubra
Fissidens dubius
Galium verum
Hieracium pilosella
Holcus lanatus
Hypnum cupressiforme
Plantago coronopus
Plantago lanceolata
Prunella vulgaris
Thymus praecox
Syntrichia ruralis var. *ruraliformis*
Trichostomum crispulum
Trifolium dubium
Trifolium repens

Field notes from Christina Campbell, Neil Lockhart & Noeleen Smyth (1 April 2009):

P. ralfsii grows here on damp peaty sand with short vegetation on a south-facing slope above the north end of the strand. Two 25 x 50 cm plots were recorded. Plot 1 was recorded on compact sandy humic soil and had a slope of 23 degrees. Plot 2 was recorded *circa* 60 m away on a similar flushed slope. Groundwater depth could not be recorded here as rock was hit at 31 cm and 25 cm below ground level at plots 1 and 2 respectively. The locality appeared grazed and a potential threat would be a change to this regime; either under-grazing which could lead to shading and competition, or over-grazing which could potentially intensify soil erosion on the steeply inclined slope. Details of two 25 x 50 cm plots recorded are below.

Rosses Strand	**Plot 1 (25 x 50 cm)**	**Plot 2 (25 x 50 cm)**
Distance from sea (m)	86	111
Altitude (metres above sea level)	29	31
Slope (degrees)	23	30
Aspect	South	South
Soil depth (cm)	15	6
Soil pH	7.78	7.86
Depth to bedrock (cm)	31	25
Mean vegetation height (cm)	4.4	3.33
Maximum vegetation height (cm)	7	7
Number of *P. ralfsii* thalli	17	7
Cover (Domin):		
Total cover	9	9
Grass cover	7	6
Sedge cover	5	4
Forb cover	4	4
Bryophyte cover	7	8
Lichen cover	0	3
Litter cover	7	5
Bare soil cover	4	4
Dung cover	+	0
Agrostis stolonifera	4	2
Amblystegium serpens var. *salinum*	3	0
Barbula convoluta	1	3
Bellis perennis	+	+
Bryum pseudotriquetrum	4	0
Carex flacca	4	4
Ctenidium molluscum	3	0
Cynosurus cristatus	0	2
Distichium inclinatum	0	2
Ditrichum gracile	4	3
Festuca rubra	6	5
Fissidens dubius	2	0
Galium verum	0	+
Hieracium pilosella	0	2
Hypnum cupressiforme	0	5
Leontodon autumnalis	0	2
Plantago coronopus	1	0
Plantago lanceolata	1	0
Prunella vulgaris	0	2
Thymus praecox	4	4
Syntrichia ruralis var. *ruraliformis*	2	4
Trifolium dubium	1	1
Trifolium repens	1	0


SAC 000194 Tranarossan and Melmore Lough
Petalophyllum ralfsii
Overview
Legend
Petalophyllum ralfsii locations
SAC 000194
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 13th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
0 260 520 1,040 Metres
N
Map Version 1.0


SAC 000194 Tranarossan and Melmore Lough
Petalophyllum ralfsii
Locality 1 Rosses Strand
Legend
Campbell & Smyth
Campbell, Lockhart & Smyth
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 13th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
0 10 20 40 Metres
N
Map Version 1.0

Sheephaven SAC (IE000190)

Locality No. 2: Rosepenna, Co. Donegal; Grid ref. C121372

Field notes from David Holyoak (5 August 1999):

P. ralfsii was located in small quantity on both sides of main R248 road, on edge of golf course and on apparent common land to east. 15 thalli, mostly small, non-fertile, located east of road, 11 west of road (including some larger, one with pseudoperianth). *P. ralfsii* is in sparse low vegetation on pathway used by people and few horses, in area grazed by rabbits. Area is currently rather heavily grazed by rabbits. Plants west of road were on areas from which turf had been cut for use elsewhere on golf course; mowing keeps vegetation short in this area, in addition to rabbit-grazing.

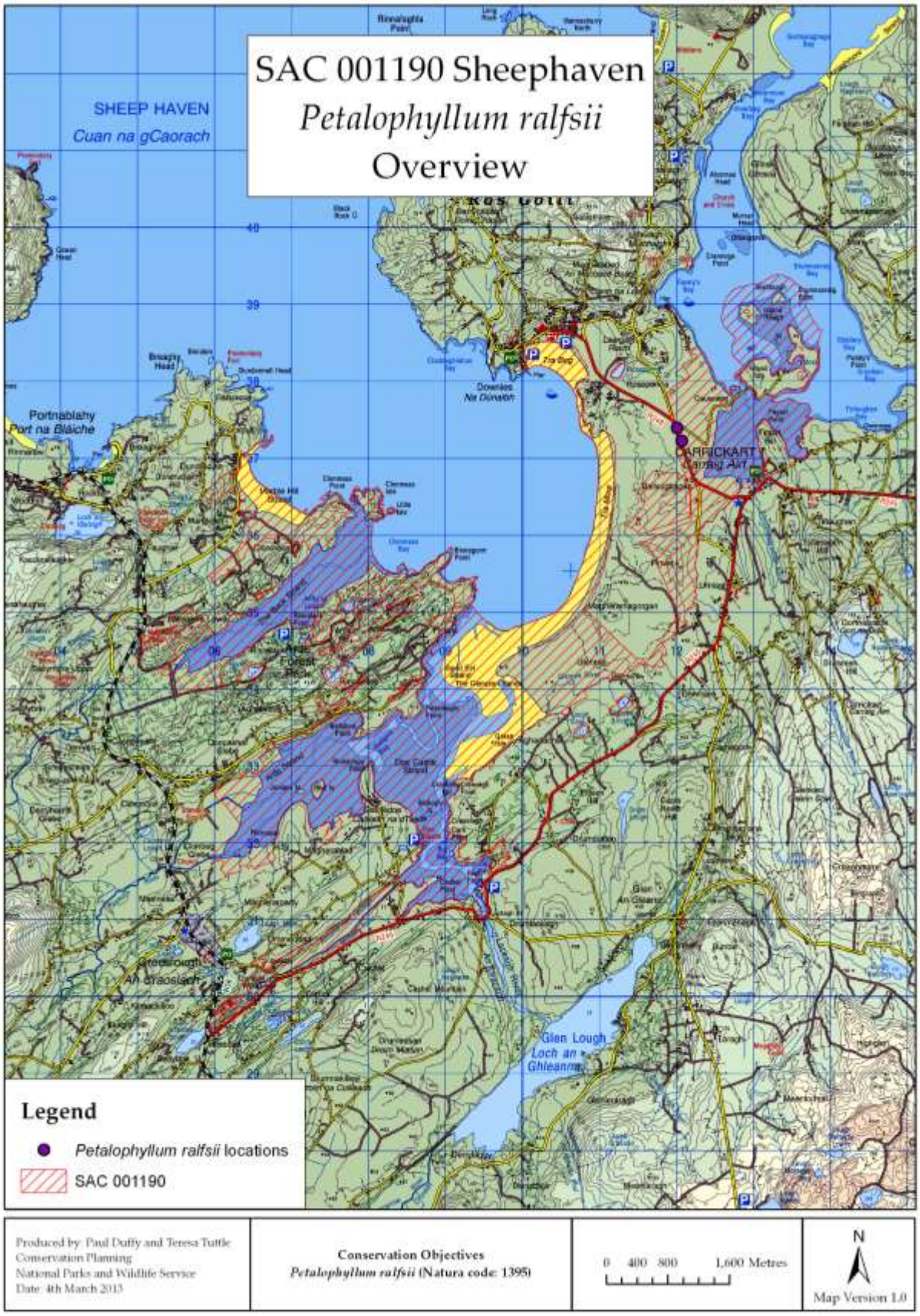
Associates:

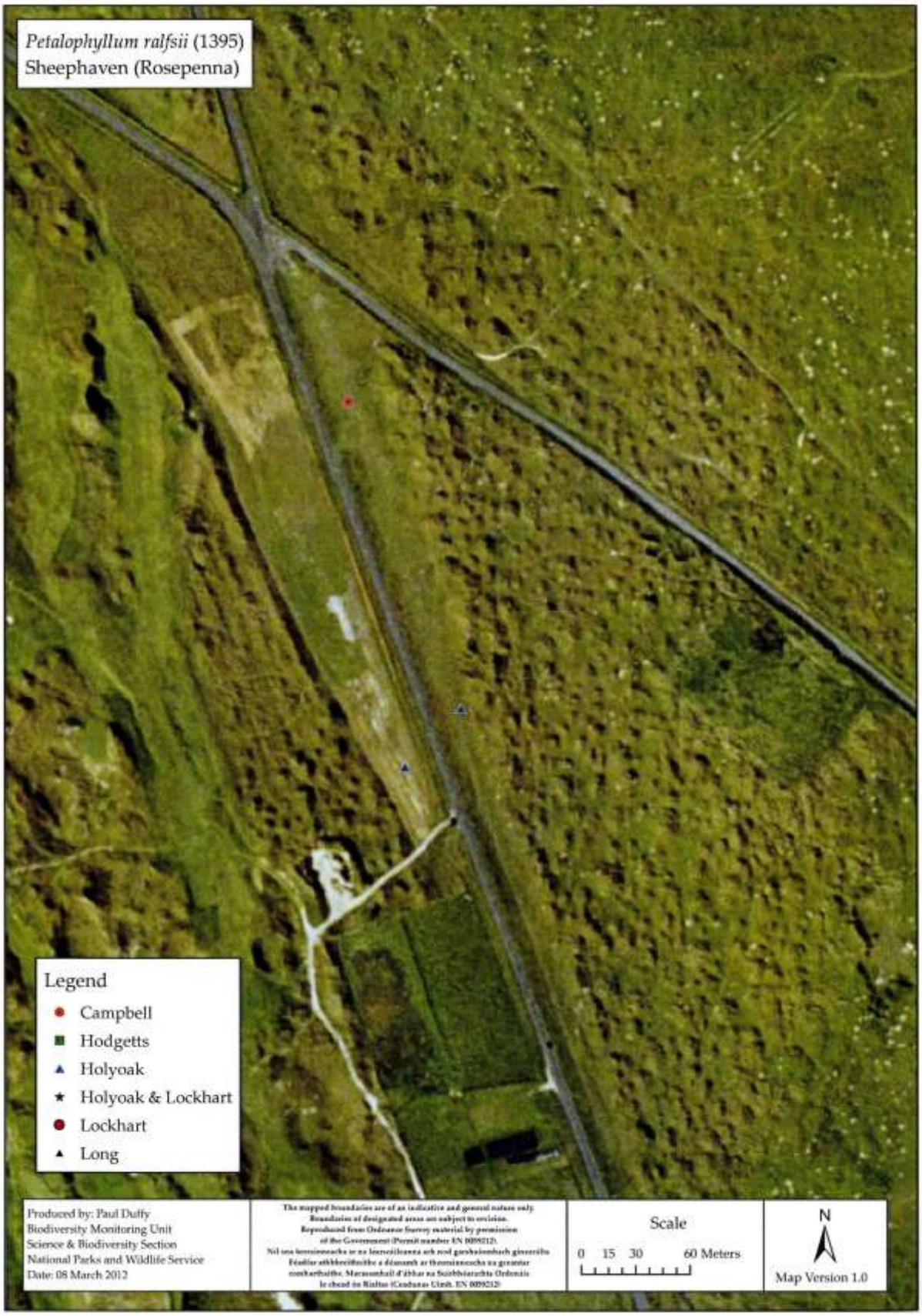
Amblyodon dealbatus
Aneura pinguis
Bellis perennis
Bryum marratii
Bryum pseudotriquetrum
Campyliadelphus chrysophyllus
Carex flacca
Cratoneuron filicinum
Ctenidium molluscum
Distichium inclinatum
Ditrichum gracile
Drepanocladus polygamus
Entodon concinnus
Euphrasia nemorosa
Festuca rubra
Holcus lanatus
Homalothecium lutescens
Juncus articulates
Juncus bufonius
Leiocolea badensis
Linum catharticum
Lotus corniculatus
Moerckia flotoviana
Pilosella officinarum
Plantago lanceolata
Prunella vulgaris
Riccia cavernosa
Salix repens
Scorpidium cossonii
Selaginella selaginoides
Thuidium abietinum ssp. *hystricosum*
Trichostomum crispulum
Trifolium pratense

Field notes from Christina Campbell, Neil Lockhart & Noeleen Smyth (1 April 2009):

One thallus was recorded on a trampled path in an area of damp sandy turf between two roads in early April 2009 where D. Holyoak had recorded 15 thalli in 1999. Similar ground on the other side of the two roads was searched, but no thalli were found. Subsequent visits in 2010 and 2011 failed to refind any thalli. The area appears to be used by vehicles practising "donuts" which could create new bare patches of soil as potential habitat, but too much on a continuous basis is damaging as the surface crust is continually broken up and vegetation cannot establish. Details of a 25 x 50 cm plot recorded are below.

Rosepenna	**Plot 1 (25 x 50 cm)**
Distance from sea (m)	859
Altitude (m.s.l.)	1.5
Slope (degrees)	0
Aspect	-
Soil depth (cm)	9
Soil pH	7.83
Depth to groundwater (cm)	60
Groundwater pH	7.72
Groundwater conductivity (µS/cm)	598
Number of *P. ralfsii* thalli	1
Mean vegetation height (cm)	1.66
Maximum vegetation height (cm)	3.4
Cover (Domin):	
Total cover	9
Grass cover	8
Sedge cover	6
Forb cover	4
Bryophyte cover	7
Lichen cover	+
Litter cover	7
Bare soil cover	4
Dung cover	+
Agrostis stolonifera	2
Barbula convoluta	4
Bellis perennis	1
Brachythecium mildeanum	2
Bryum pseudotriquetrum	4
Calliergonella cuspidata	2
Campylium chrysophyllum	+
Carex flacca	6
Ditrichum gracile	4
Festuca rubra	7
Lotus corniculatus	+
Plantago lanceolata	+
Prunella vulgaris	2
Trifolium repens	2


SAC 001190 Sheephaven
Petalophyllum ralfsii
Overview
SHEEP HAVEN
Cuan na gCaorach
Portnablahy
Port na Blaiche
Downies
Na Dúnaibh
CARRICKART
Carraig Airt
Glen Lough
Loch an Ghleanna
Greeslough
An Craoslach
Legend
Petalophyllum ralfsii locations
SAC 001190
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 4th March 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
0 400 800 1,600 Metres
N
Map Version 1.0


Petalophyllum ralfsii (1395)
Sheephaven (Rosepenna)
Legend
Campbell
Hodgetts
Holyoak
Holyoak & Lockhart
Lockhart
Long
Produced by: Paul Duffy
Biodiversity Monitoring Unit
Science & Biodiversity Section
National Parks and Wildlife Service
Date: 08 March 2012
Scale
0 15 30 60 Meters
N
Map Version 1.0

Horn Head and Rinclevan SAC (IE000147)

Locality No. 3: Tramore/Black Burrow/SW of Dunfanaghy, Co. Donegal; Grid ref. B982360

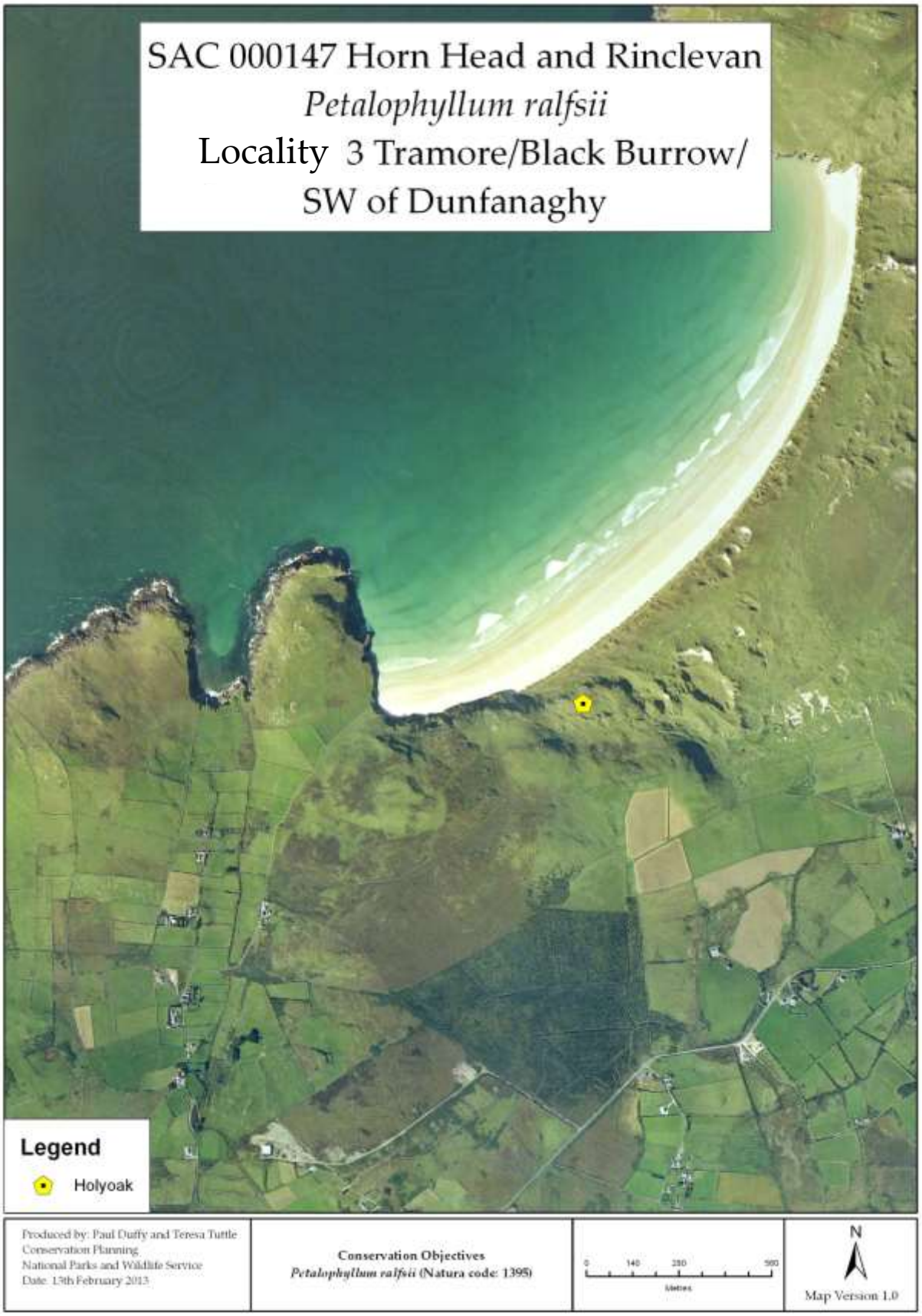
Field notes from David Holyoak (2 June 2002):

Three thalli in unshaded carpet of low mosses on thin, damp sandy soil overlying more or less horizontal rock on top of low rocky knoll above sand beach and near dunes. All vegetation very short (< 3 cm), heavily grazed by sheep, cattle and rabbits. Tiny population potentially at risk from accidents such as trampling by stock or burial by loose rock.

Associates:

Bellis perennis
Distichium inclinatum
Ditrichum gracile
Festuca rubra
Linum catharticum
Plantago coronopus
Scapania sp.
Trichostomum crispulum (dominant)
Thymus sp.


SAC 000147 Horn Head and Rinclevan
Petalophyllum ralfsii
Overview
Horn Head
Corrán Binne
DUNFANAGHY
Dún Fionnachaidh
Portnablahy
Port na Bláiche
Trawore Strand
Legend
Petalophyllum ralfsii location
SAC 000147
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 13th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
Metres
N
Map Version 1.0


SAC 000147 Horn Head and Rinclevan
Petalophyllum ralfsii
Locality 3 Tramore/Black Burrow/
SW of Dunfanaghy
Legend
Holyoak
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 13th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
0
140
280
560
Metres
N
Map Version 1.0

Gweedore Bay & Islands SAC (IE001141)

Locality No. 4a: 02 Damph Beg (N. of Gweedore Bay/Bunlack Machair), Co. Donegal; Grid ref. B8295

Field notes from David Holyoak (4 August 1999):

Small populations of *P. ralfsii* in slack area with a rich flora. Eight small non-fertile thalli counted, but ground rather dry following week with much dry weather. Additional 16 thalli found later, some larger and with antheridia. *P. ralfsii* is at edge of track used to obtain sand from dunes so at risk from increased use or disuse of track. Also potentially at risk from dumping of rubbish.

Field notes from David Holyoak (27 April 2002):

Seven thalli counted with low moss and patchy low phanaerogams on gravelly sand of small low bank above track into small disused sand-quarry, above edge of dune slack. Potentially at risk from damage due to off-road vehicles, or dumping of rubbish near track edge.

Field notes from Neil Lockhart (8 May 2006):

Refound location but did not find *P. ralfsii*. Much litter, broken glass, dumping in vicinity. Also active removal of sand. Prospects for survival reasonable, but small available niche is vulnerable.

Associates:

Amblyodon dealbatus
Aneura pinguis
Bryum cf. *algovicum* var. *rutheanum*
Bryum pallens
Carex flacca
Carex arenaria
Didymodon fallax
Didymodon tophaceus
Distichium inclinatum
Ditrichum gracile
Drepanocladus polygamus
Festuca rubra
Galium verum
Luzula campestris
Moerckia flotoviana
Parnassia palustris
Plantago lanceolata
Scorpidium cossonii
Senecio jacobaea
Trichostomum brachydontium
Tussilago farfara


SAC 001141 Gweedore Bay and Islands
Petalophyllum ralfsii
Overview
Atlan
Bloody Foreland
Cnoc Fola
Population 4a: Damph Beg
Population 4b: Derrybeg
Population 4c: Keadew Point
THE ROSSES
Na Rosa
Legend
Petalophyllum ralfsii locations
SAC 001141
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 29th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 001141 Gweedore Bay and Islands
Petalophyllum ralfsii
Locality 4a Damph Beg
Legend
Holyoak
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 29th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Gweedore Bay & Islands SAC (IE001141)

Locality No. 4b: Derrybeg, Co. Donegal; Grid ref. B799262

Field notes from David Holyoak (28 April 2002):

Three thalli on low NW-facing part of bank just above edge of dune slack, growing on wet humic sand with very low, patchy moss-rich grassland (2.4 cm high). Whole area is currently grazed by sheep. Off-road driving has caused damage to parts of machair and slacks, but this species is not directly affected.

Field notes from Neil Lockhart (8 May 2006):

P. ralfsii not refound at exact original location. Habitat is as described. 12 plants of *P. ralfsii* found a few metres away (B7986526198).

Associates:

Aneura pinguis
Bellis perennis
Bryum pallens
Carex flacca
Ctenidium molluscum
Distichium inclinatum
Ditrichum gracile
Festuca rubra
Fissidens dubius
Leiocolea badensis
Leontodon autumnalis
Pilosella officinarum
Prunella vulgaris
Ranunculus bulbosus
Selaginella selaginoides
Trichostomum crispulum


SAC 001141 Gweedore Bay and Islands
Petalophyllum ralfsii
Locality 4b Derrybeg
Legend
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 29th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Gweedore Bay & Islands SAC (IE001141)

Locality No. 4c: Keadew Point, Co. Donegal; Grid. ref. B733182

Field notes from Neil Lockhart (9 February 1998):

More than 20 plants scattered on flat ground on the edges of two ponds, artificially derived from (scraw) cutting. Suitable ground also occurs around the margins, and between the several other ponds. This is possibly the locality of Crundwell's 1962 record. This area has been disturbed for scraw cutting and has created suitable mossy turf for *P. ralfsii*. Some further cutting may be beneficial. No other threats except dumping of domestic junk.

Field notes from David Holyoak (25 April 2002):

16 thalli in one small area, in unshaded low moss carpet (< 2 cm) on damp sand of small hollow at base of low granitic hill at edge of sand dunes. Potentially at risk from reduction of grazing, or from further 'theft' of turf for lawns.

Field notes from Neil Lockhart (9 May 2006):
Three thalli at B7308918141.

Associates:

Agrostis stolonifera
Anagallis tenella
Bellis perennis
Bryum pallens
Bryum pseudotriquetrum
Campylium stellatum
Carex arenaria
Ctenidium molluscum
Didymodon ferrugineus
Distichium inclinatum
Ditrichum gracile
Drepanocladus polygamus
Euphrasia sp.
Festuca rubra
Fissidens taxifolius
Lophocolea bidentata
Lotus corniculatus
Pilosella officinarum
Plantago lanceolata
Poa pratensis
Preissia quadrata
Prunella vulgaris
Pseudoscleropodium purum
Thymus praecox
Trifolium repens

Field notes from Christina Campbell, Neil Lockhart, & Noeleen Smyth (2 April 2009):

Two plots (25 x 50 cm) were recorded at this population. Only 1 thallus was found in the area described by Lockhart in 1998. Plot 1 was recorded in this area, but no thalli were relocated during subsequent visits in spring 2010 and spring 2011. The area described by Holyoak in 2002 was also examined. However, when the location was revisited, this area was overgrown and unsuitable for *P. ralfsii*. A small population covering *circa* 24.3 m^2 was discovered on a layer of humus-rich sand *circa* 1 cm thick overlying pure sand on a rocky outcrop above the shoreline in April 2009 and Plot 2 was

recorded here. The area appeared potentially at risk from under-grazing and some dumping was also observed. Details of two 25 x 50 cm plots recorded are below.

Keadew Point	**Plot 1 (25 x 50 cm)**	**Plot 2 (25 x 50 cm)**
Distance from sea (m)	120	19
Altitude (metres above sea level)	3.1	0.7
Slope (degrees)	0	10
Aspect	-	South-west
Soil depth (cm)	5	1
Soil pH	7.92	7.89
Depth to groundwater (cm)	51	Hit rock at 30cm
Groundwater pH	7.52	NA
Groundwater conductivity (µS/cm)	583	NA
Number of *P. ralfsii* thalli	1	6
Mean vegetation height (cm)	7.24	2.77
Maximum vegetation height (cm)	11.6	3.8
Cover (Domin):		
Total cover	10	9
Grass cover	4	5
Sedge cover	2	4
Forb cover	3	4
Bryophyte cover	9	8
Litter cover	7	7
Bare soil cover	+	4
Anagallis tenella	+	0
Aneura pinguis	0	2
Anthyllis vulneraria	0	1
Armeria maritima	2	0
Barbula convoluta	2	0
Bellis perennis	1	1
Brachythecium albicans	0	3
Bryum pallens	2	3
Bryum pseudotriquetrum	4	4
Calliergonella cuspidata	4	2
Campylium stellatum	2	0
Carex arenaria	1	0
Carex flacca	2	4
Cochlearia officinalis agg.	+	0
Daucus carota	1	1
Distichium inclinatum	5	4
Ditrichum gracile	4	4
Festuca rubra	4	4
Fissidens taxifolius var. *taxifolius*	2	0
Galium verum	+	0
Hieracium pilosella	2	2
Hypnum cupressiforme	3	2
Leontodon autumnalis	+	2
Lotus corniculatus	1	1
Luzula campestris	+	0
Plantago lanceolata	2	0
Prunella vulgaris	0	2
Sagina nodosa	0	2
Scapania gracilis	3	2
Succisa pratensis	0	2
Thymus praecox	2	2
Syntrichia ruralis var. *ruraliformis*	4	7
Trifolium repens	2	2


SAC 001141 Gweedore Bay and Islands
Petalophyllum ralfsii
Locality 4c Keadew Point
Legend
Campbell & Smyth
Campbell, Lockhart & Smyth
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 29th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

West of Ardara/Maas Road SAC (IE000197)

Locality No. 5a: Dooey Point, Co. Donegal; Grid. ref. B757021

Field notes from David Holyoak (3 August 1999):

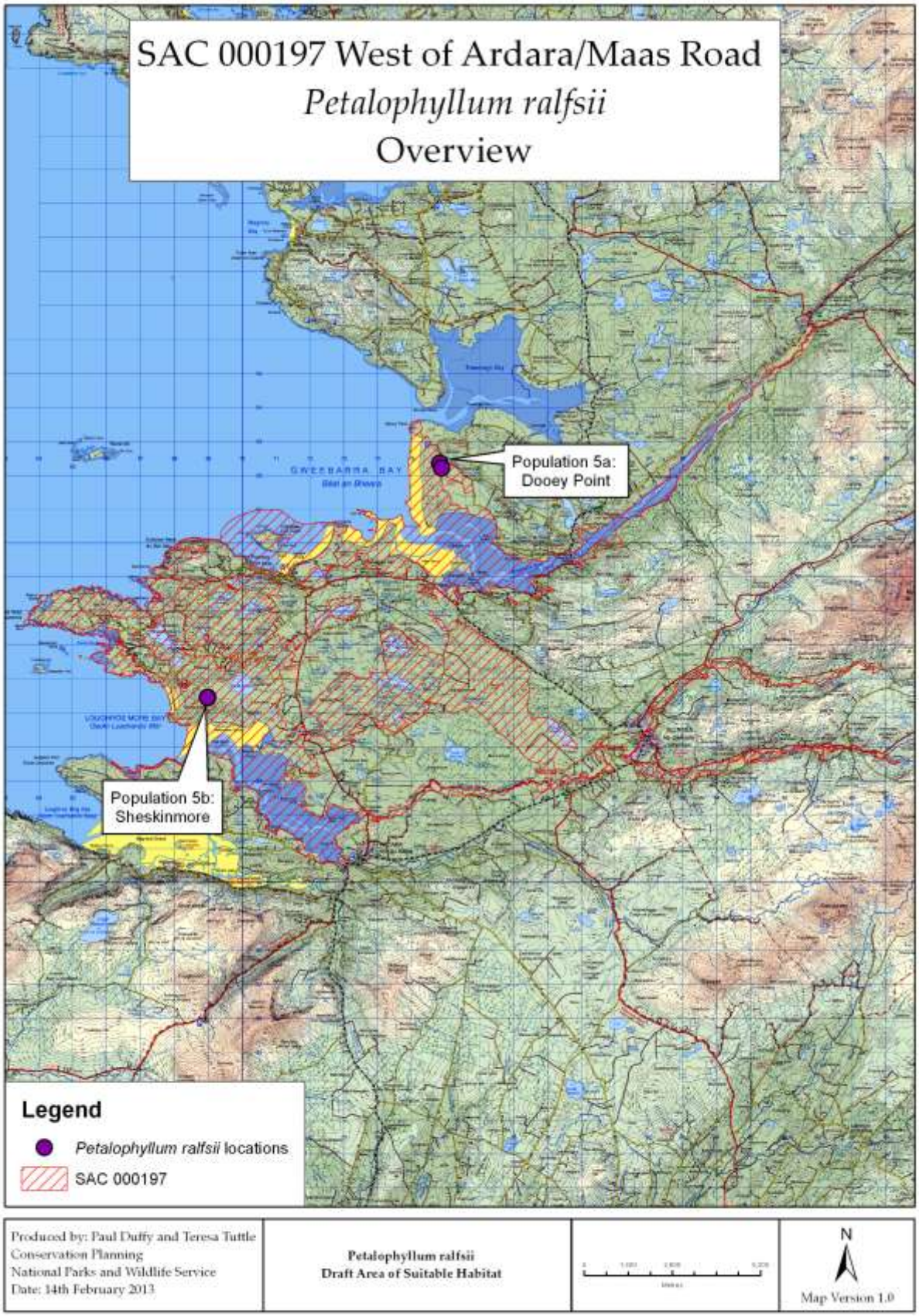
A small population of *P. ralfsii* was located near the northern end of the machair, a new record at this locality. Four thalli seen. *P. ralfsii* depends on small bare areas created by disturbance, in wheel ruts, etc.

Field notes from David Holyoak (24 April 2002):

Three small thalli, all close together, on small, mainly bare patch of humic sand exposed on low ridge (bank between old fields) in wide, shallow dune-slack area supporting short grassland that is heavily grazed by cattle.

Associates:

Amblystegium serpens var. *salinum*
Aneura pinguis
Bellis perennis
Carex flacca
Ctenidium molluscum
Danthonia decumbens
Ditrichum gracile
Euphrasia nemorosa
Galium verum
Homalothecium lutescens
Hylocomium splendens
Hypochaeris radicata
Linum catharticum
Lotus corniculatus
Parnassia palustris
Pilosella officinarum
Plantago coronopus
Plantago lanceolata
Plantago maritima
Prunella vulgaris
Salix repens
Selaginella selaginoides
Thuidium abietinum ssp. *hystricosum*
Thymus praecox
Trifolium repens


SAC 000197 West of Ardara/Maas Road
Petalophyllum ralfsii
Overview
Population 5a:
Dooey Point
Population 5b:
Sheskinmore
Legend
Petalophyllum ralfsii locations
SAC 000197
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 14th February 2013
Petalophyllum ralfsii
Draft Area of Suitable Habitat
N
Map Version 1.0


SAC 000197 West of Ardara/Maas Road
Petalophyllum ralfsii
Locality 5a Dooey Point
Legend
Holyoak
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 14th February 2013
Petalophyllum ralfsii
Draft Area of Suitable Habitat
N
Map Version 1.0

West of Ardara/Maas Road SAC (IE000197)

Locality No. 5b: Sheskinmore, Co. Donegal; Grid. ref. G690953

Field notes from Neil Lockhart (11 February 1998):

Two colonies, about 4 m apart, with 20 and 30 plants respectively. On a steeply sloping sandy bank beside a narrow water track, with some outcropping limestone immediately adjacent. This area is surrounded by rabbit burrows further up the slope. No perceived threats at present, maintenance of open turf by rabbit grazing is probably beneficial. Current cattle grazing regime is 8 cattle to 150 acres, October 1 – March 31.

Field notes from Neil Lockhart (9 May 2006):

Very dry, but found just one plant at G6898095454, just above rock outcrop, close to original find.

Associates:
Aneura pinguis
Bellis perennis
Brachythecium albicans
Bryum pseudotriquetrum
Calliergonella cuspidata
Carex cf. *flacca*
Cerastium fontanum
Ditrichum gracile
Festuca rubra
Lophocolea bidentata
Luzula campestris
Plantago coronopus
Poa pratensis
Prunella vulgaris
Ranunculus bulbosus
Rhytidiadelphus squarrosus
Riccardia multifida
Thymus praecox
Trichostomum crispulum
Trifolium repens

Field notes from Christina Campbell, Neil Lockhart & Noeleen Smyth (31 March 2009):

A population of *circa* 30 thalli occurred over an extent of *ca.* 13.75 m^2 along the edge of a sandy bank in short turf with high bryophyte cover above a limestone outcrop. Two 25 x 50 cm plots were recorded. Plot 1 was recorded on sand sitting on a layer of peat *ca.* 40 cm deep overlying limestone. Plot 2 was recorded on a layer of peaty sand 10 cm deep, followed by 17 cm of grey sand overlying iron-stained, fine, gritty silty clay. The groundwater table was reached at 37 cm from the surface. The area appeared to be grazed and cattle and rabbit dung was observed. Details of two 25 x 50 cm plots recorded are below.

Sheskinmore	**Plot 1 (25 x 50 cm)**	**Plot 2 (25 x 50 cm)**
Distance from sea (m)	515	518
Altitude (metres above sea level)	9.0	8.1
Slope (degrees)	5	15
Aspect	West	South-west
Soil depth (cm)	7	10
Soil pH	8.25	7.96
Depth to groundwater (cm)	47	37
Groundwater pH	NA	7.3
Groundwater conductivity (µS/cm)	NA	484
Number of *P. ralfsii* thalli	8	1
Mean vegetation height (cm)	5	4
Maximum vegetation height (cm)	8.6	6.5
Cover (Domin):		
Total cover	9	10
Grass cover	7	7
Sedge cover	3	5
Forb cover	4	4
Bryophyte cover	7	8
Litter cover	5	7
Bare cover	4	3
Dung cover	4	0
Agrostis stolonifera	0	4
Aneura pinguis	0	4
Anthyllis vulneraria	+	+
Barbula convoluta	2	0
Bellis perennis	+	0
Brachythecium albicans	0	2
Bryum pseudotriquetrum	4	4
Bryum sp.	3	0
Calliergonella cuspidata	3	1
Carex flacca	3	4
Ctenidium molluscum	0	5
Ditrichum gracile	5	4
Festuca rubra	6	5
Galium verum	0	+
Holcus lanatus	4	4
Hypnum cupressiforme	2	0
Leontodon autumnalis	1	+
Lolium perenne	+	+
Lophocolea bidentata	1	0
Mnium hornum	0	+
Plantago coronopus	0	+
Plantago lanceolata	1	2
Prunella vulgaris	3	2
Ranunculus bulbosus	1	3
Rhytidiadelphus squarrosus	1	+
Sagina nodosa	+	0
Scapania gracilis	4	1
Thymus praecox	4	1
Trichostomum brachydontium	1	+
Trifolium repens	2	2


SAC 000197 West of Ardara/Maas Road
Petalophyllum ralfsii
Locality 5b Sheskinmore
Legend
Campbell & Smyth
Campbell, Lockhart & Smyth
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 14th February 2013
Petalophyllum ralfsii
Draft Area of Suitable Habitat
N
Map Version 1.0

Bunduff Lough & Machair/Trawalua/Mullaghmore SAC (IE000625)

Locality No. 6: Bunduff Machair, Co. Sligo; Grid ref. G707563

Field notes from Neil Lockhart (11 March 1998):

Two colonies, one of 18 rosettes, the other of 2 rosettes. Another 2 rosettes seen about 10 m SE along the track. Plants occur on compacted sandy soil on a ridge between wheel ruts on an occasionally used vehicle trackway. No perceived threats.

Field notes from David Holyoak (31 July 1999):

76 thalli counted in about 1 hour, but coverage incomplete and nearby areas of possible habitat (e.g. along track) were dry at time of survey. No immediate threats apparent. Area grazed by cattle and rabbits, so important to maintain level of grazing and water table.

Field notes from Nick Hodgetts (27 June 2003):

Two very small female thalli seen at edge of dune slack in slightly blown-out area, in shelter of crescent-moon-shaped dune.

Associates

Agrostis stolonifera
Aneura pinguis
Bellis perennis
Brachythecium mildeanum
Bryum pseudotriquetrum
Carex flacca
Cynosurus cristatus
Didymodon ferrugineus
Ditrichum gracile
Equisetum variegatum
Euphrasia sp.
Festuca rubra
Hylocomium splendens
Hypochaeris radicata
Juncus articulatus
Leontodon saxatilis
Moerckia flotoviana
Parnassia palustris
Pellia endiviifolia
Pohlia wahlenbergii
Polygala serpyllifolia
Pseudoscleropodium purum
Prunella vulgaris
Riccardia multifida
Sagina nodosa
Sagina procumbens
Scorpidium cossonii
Selaginella selaginoides
Senecio jacobaea
Taraxacum officinalis
Thuidium abietinum spp. *hystricosum*
Thymus praecox
Trifolium repens

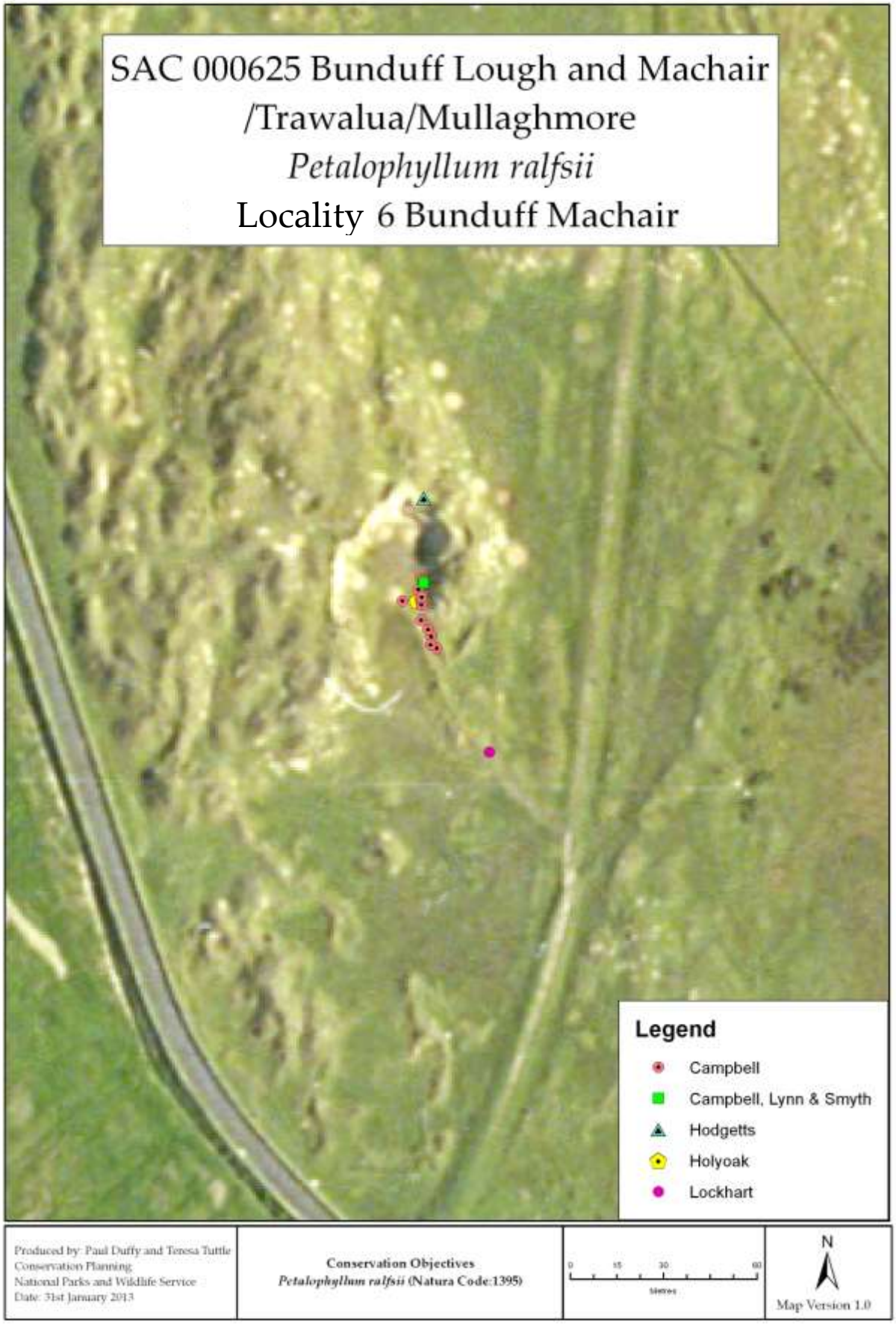
Field notes from Christina Campbell (30 March 2009):

The population here occurs on a track at the eastern edge of a dune slack *circa* 22 m long and 1.5–2 m wide, covering an area of *ca*. 24.3 m^2. The main area of the slack was very wet with standing water present and a dominance of *Calliergonella cuspidata*. Three plots (25 x 50 cm) were recorded along the

track on a sandy loam *ca.* 2–3 cm deep above pure sand. The area appeared grazed by cattle and rabbits and so a potential threat would be any change to this regime. Details of three 25 x 50 cm plots recorded are below.

Bunduff	**Plot 1 (25 x 50 cm)**	**Plot 2 (25 x 50 cm)**	**Plot 3 (25 x 50 cm)**
Distance from sea (m)	503	502	500
Altitude (metres above sea level)	3	2.5	2.26
Slope (degrees)	0	5	3
Aspect	-	South	West
Soil depth (cm)	2	2	3
Soil pH	8.35	8.37	8.12
Depth to groundwater (cm)	33	26	18
Groundwater pH	7.29	7.28	7.29
Groundwater conductivity (µS/cm)	579	620	549
Number of *P. ralfsii* thalli	5	2	4
Mean vegetation height (cm)	2.8	3.2	2.5
Maximum vegetation height (cm)	6	7	6
Cover (Domin):			
Total cover	9	9	10
Grass cover	6	5	6
Sedge cover	4	4	4
Forb cover	4	4	4
Fern/ fern allies cover	2	3	2
Bryophyte cover	5	7	8
Litter cover	7	6	6
Bare soil cover	4	4	3
Ammophila arenaria	0	0	3
Aneura pinguis	3	4	0
Anthoxanthum odoratum	1	0	0
Barbula convoluta	3	0	0
Bellis perennis	1	0	0
Brachythecium mildeanum	1	0	0
Bryum pseudotriquetrum	0	3	3
Calliergonella cuspidata	4	4	5
Carex flacca	4	4	4
Didymodon fallax	3	0	0
Ditrichum gracile	4	2	3
Entodon concinnus	1	2	2
Equisetum variegatum	1	1	2
Festuca rubra	6	5	6
Hieracium pilosella	1	0	2
Leontodon autumnalis	2	1	3
Lotus corniculatus	2	3	1
Plantago coronopus	0	0	+
Prunella vulgaris	0	3	4
Ranunculus bulbosus	2	1	0
Rhytidiadelphus squarrosus	0	0	2
Sagina nodosa	1	0	0
Selaginella selaginoides	1	3	1
Thuidium tamariscinum	3	4	2
Thymus praecox	2	2	1
Trifolium repens	3	3	3


SAC 000625 Bunduff Lough and Machair /Trawalua/Mullaghmore
Petalophyllum ralfsii
Overview
Legend
Petalophyllum ralfsii locations
SAC 000625
Produced by: Paul Duffy and Teresa Tuffle
Conservation Planning
National Parks and Wildlife Service
Date: 31st January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura Code:1395)
0 500 1,000 2,000
Metres
N
Map Version 1.0


SAC 000625 Bunduff Lough and Machair /Trawalua/Mullaghmore
Petalophyllum ralfsii
Locality 6 Bunduff Machair
Legend
Campbell
Campbell, Lynn & Smyth
Hodgetts
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 31st January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura Code:1395)
0
15
30
60
Metres
N
Map Version 1.0

Glenamoy Bog Complex SAC (IE000500)

Locality No. 7: Garter Hill, Co. Mayo; Grid ref. F80_40_, etc.

Field notes from Neil Lockhart (7 April 1998):
Several hundred plants seen. Plenty of suitable habitat. Plants very frequent at this locality, on banks of water tracks and also on sides of low sandhills in wetter flushed parts of machair. Many thousands of plants seems to be a probable estimate. Currently heavily grazed by sheep, which may favour open turf for *P. ralfsii*. No other perceived threats.

Field notes from David Holyoak (16 April 1999):
Continuously distributed over *ca*. 1,600 m, in strip of land *ca.* 100 m wide, so population estimate of 1.6 million thalli, based on approximate density of 10 per square metre. Fewer further east. Also several hundred more slightly to the east. Flushed machair slopes, changing eastward into extensive dune slack. Further east *P. ralfsii* more localised in damp hollows. Present intensive sheep grazing is good for *P. ralfsii*, but causing some sand erosion. Localised damage in west part of area results from vehicle rutting and turf cutting for lawns and graves.

Field notes from David Holyoak (30 September - 1 October 2003):
30 September 2003: F80694065: > 1000 thalli scattered over many tens of m^2; F81844089: *ca.* 16 thalli by stream edge; F81884081: hundreds of thalli; F82064069: thousands of thalli in sparsely vegetated hollow; small populations also seen at several intervening locations. Very large population recorded by survey in spring 1999 evidently still persists here. The habitat is still ideal over large areas of wet machair that remains intensively grazed by sheep. No sporophytes seen, but many plants with antheridia and few with perianths. On 1 October 2003, a few thalli were found further east at F82614070.

Field notes from Neil Lockhart (4 July 2006):
Little change since first visit in 1998 - abundant suitable habitat still occurs, still lightly grazed by sheep. Several plants (tens) found at F8106540671 beside stream where 1998 relevé 2 was recorded. Poor time of year for survey.

Associates:

Agrostis stolonifera
Amblyodon dealbatus
Amblystegium serpens var. *salinum*
Anagallis tenella
Aneura pinguis
Barbula convoluta
Bellis perennis
Brachythecium rivulare
Bryoerythrophyllum recurvirostrum
Bryum cf. *algovicum*
Bryum cf. *capillare*
Bryum pseudotriquetrum
Calliergonella cuspidata
Campyliadelphus chrysophyllus
Carex arenaria
Carex flacca
Cerastium fontanum
Cratoneuron filicinum
Dichodontium cf. *pellucidum*
Didymodon fallax
Distichium inclinatum
Ditrichum gracile
Eleocharis sp.
Equisetum variegatum

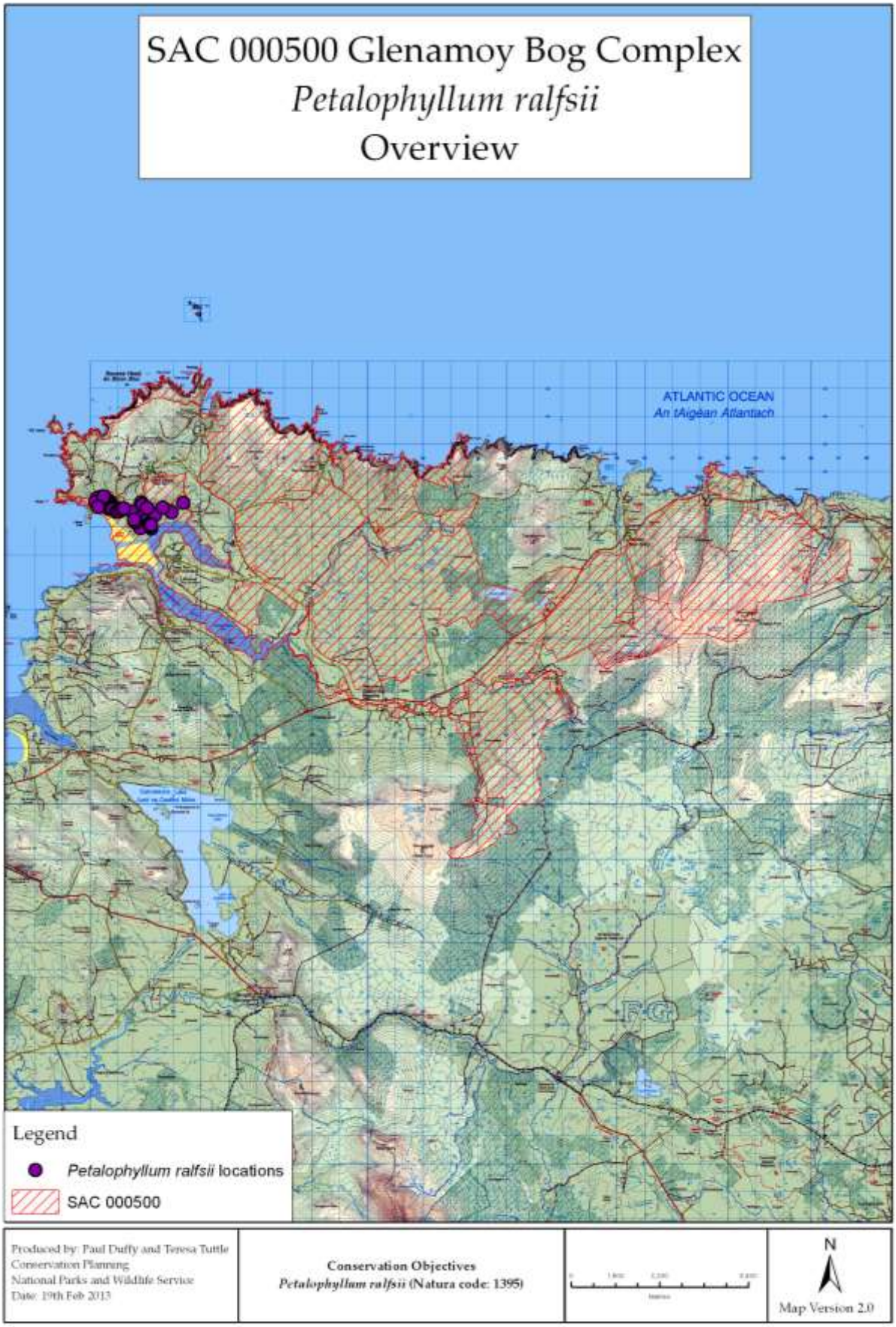
Festuca rubra
Fossombronia incurva
Homalothecium lutescens
Hypnum cupressiforme
Leontodon autumnalis
Leontodon saxatilis
Lophocolea bidentata
Lotus corniculatus
Pilosella officinarum
Plantago coronopus
Plantago lanceolata
Pohlia wahlenbergii
Prunella vulgaris
Ranunculus repens
Rhytidiadelphus squarrosus
Sagina procumbens
Syntrichia ruralis
Taraxacum officinale
Thuidium abietinum spp. *hystricosum*
Trichostomum crispulum
Trifolium repens

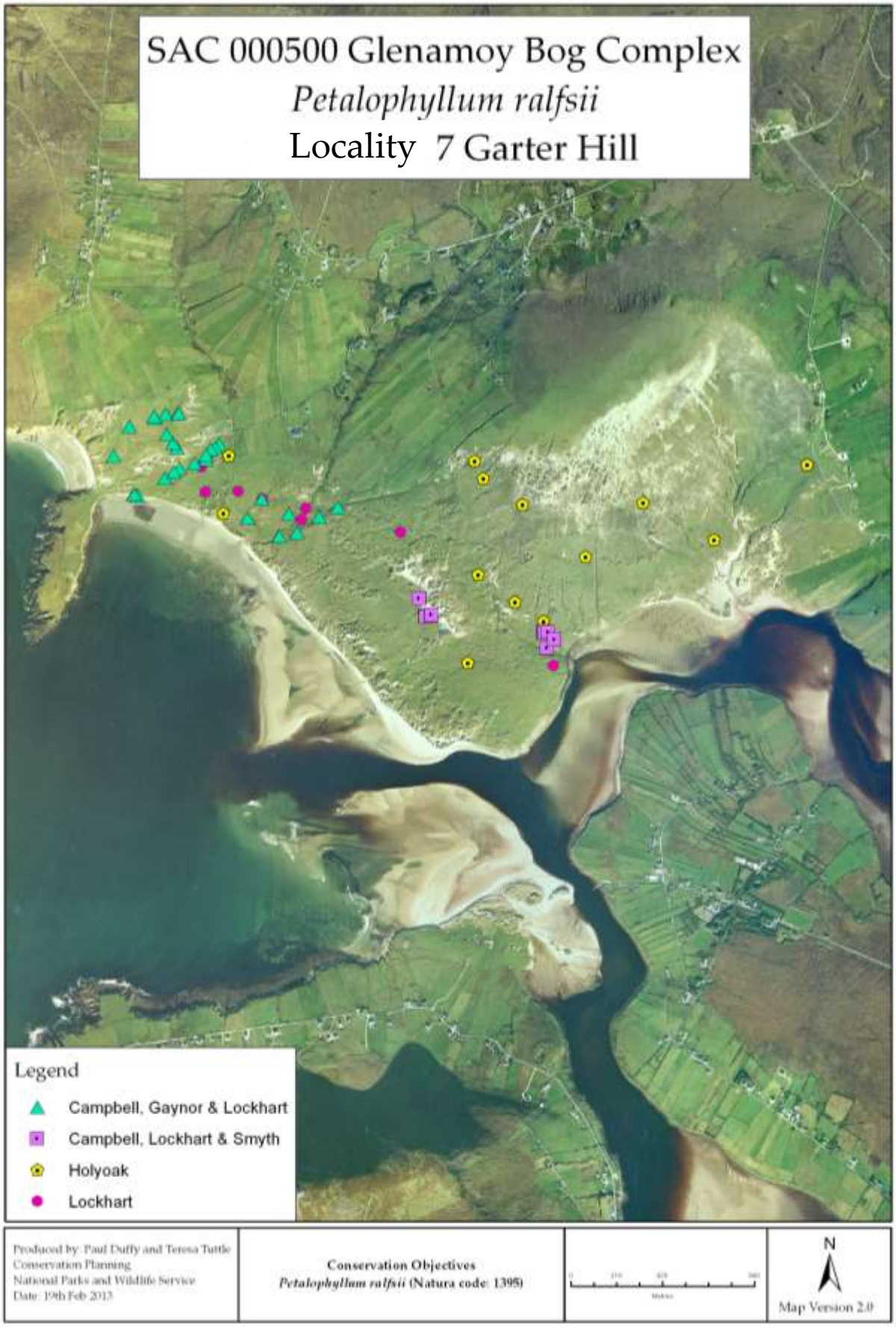
Field notes from Christina Campbell, Karen Gaynor, Neil Lockhart and Noeleen Smyth (12-14 May 2009 (CC, KG & NL only) & 21 April 2010 (CC, NL & NS only)):

The site is an extensive, slightly undulating, machair plain with many streams running down towards the sea and with windblown sand occurring right up onto the hills behind the plain. Seven plots (25 x 50 cm) were recorded, located on the sides of sandy banks and hummocks, on machair plain that extended to the sea shore and in the blowout area of a dune. Evidence of scraw cutting was evident as was dumping in parts of the machair. The area appeared heavily grazed which is beneficial for *P. ralfsii*, but which may lead to erosion. Over-grazing is considered to have led to the degradation of the machair habitat at the site. Details of four 25 x 50 cm plots recorded are below.

Garter Hill	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**
Year	2009	2009	2009	2009	2009	2010	2010
Distance from sea (m)	439	20	192	252	281	203	431
Altitude (metres above sea level)	26.7	3	8.5	4.97	11.63	7.23	14.32
Slope (degrees)	8	20	20	0	10	5	0
Aspect	West	South/ south east	South	-	South	South	-
Soil depth (cm)	9	0.5	12	3	9	5	1
Soil pH	8.03	8.19	8.1	8.13	7.83	7.89	8.08
Depth to groundwater (cm)	66	30	51	34	34	34	25
Groundwater pH	6.96	7.23	6.97	6.97	6.97	7.62	7.35
Groundwater conductivity (µS/cm)	806	407	783	718	757	453	781
Number of *P. ralfsii* thalli	14	12	2	7	4	4	7
Mean vegetation height (cm)	2.58	2.42	3.48	3	2.57	2.54	1.9
Maximum vegetation height (cm)	4.5	3.5	6	4.5	4	3.5	3
Cover (Domin):							
Total cover	10	10	10	9	10	10	9
Rush cover	0	0	0	1	0	0	+
Grass cover	6	9	6	5	6	7	8
Sedge cover	4	0	3	4	5	5	0
Forb cover	6	4	6	5	7	7	4
Fern/ fern allies cover	0	0	0	0	0	2	0
Bryophyte cover	9	7	9	9	8	10	5
Algae cover	0	+	0	0	+	0	1
Litter cover	5	7	4	5	4	6	6
Bare soil cover	+	4	1	4	2	1	4
Dung cover	0	1	0	0	2	2	0

Garter Hill (continued)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Achillea millifolia	0	2	0	0	0	0	0
Agrostis stolonifera	0	6	2	1	1	2	1
Amblyodon dealbatus	0	0	0	2	0	0	0
Amblystegium serpens var. *salinum*	2	5	3	4	3	0	0
Aneura pinguis	0	2	0	4	3	5	0
Anthoxanthum odoratum	1	0	0	0	0	0	0
Barbula convoluta	4	3	0	3	2	0	0
Bellis perennis	2	3	1	0	4	4	0
Brachythecium albicans	0	0	0	0	3	0	0
Bryum pallens	3	0	0	4	3	0	0
Bryum pseudotriquetrum	0	0	2	2	0	5	4
Bryum sp.	0	2	0	0	1	5	0
Calliergonella cuspidata	0	1	0	0	0	0	1
Carex arenaria	1	0	2	1	0	0	0
Carex flacca	4	0	2	4	5	5	0
Cerastium fontanum	1	0	1	0	0	0	0
Ctenidium molluscum	1	0	0	0	4	0	0
Daucus carota	0	2	4	0	2	0	0
Didymodon fallax	3	3	3	4	3	0	0
Distichium inclinatum	4	0	0	0	0	0	0
Ditrichum gracile	4	2	3	0	4	0	0
Entodon concinnus	0	0	1	0	1	0	0
Erophila verna	1	0	0	0	0	0	0
Euphrasia sp.	0	0	0	0	1	0	0
Festuca rubra	6	8	6	5	6	7	8
Galium verum	0	0	+	0	2	0	0
Homalothecium lutescens	0	3	4	0	0	0	0
Hydrocotyle vulgaris	0	0	+	0	0	0	0
Hypnum cupressiforme	4	2	8	0	2	0	0
Juncus articulatus	0	0	0	1	0	0	+
Leontodon autumnalis	0	0	5	4	1	4	0
Linum catharticum	0	0	0	0	1	0	0
Lophocolea bidentata	0	1	0	0	0	0	0
Lotus corniculatus	0	1	1	0	+	3	0
Luzula campestris	0	0	2	0	1	0	0
Plagiochila asplenioides	1	0	0	0	0	0	0
Plagiomnium sp.	0	0	3	0	0	0	0
Plantago coronopus	2	1	2	4	4	3	2
Plantago lanceolata	0	2	0	0	4	0	0
Poa annua	0	0	0	+	0	0	0
Prunella vulgaris	2	0	1	1	+	0	0
Ranunculus bulbosus	0	0	0	0	1	0	0
Rhytidiadelphus squarrosus	0	0	+	0	0	0	0
Sagina nodosa	+	0	+	0	0	2	3
Saxifraga tridactylites	2	0	0	0	1	0	0
Scorpidium revolvens	0	0	0	0	0	2	0
Selaginella selaginoides	0	0	0	0	0	2	0
Taraxacum officinale	0	0	0	0	0	+	0
Thymus praecox	5	0	5	0	4	0	0
Syntrichia ruralis var. *ruraliformis*	+	0	+	2	0	0	0
Trifolium repens	1	0	4	0	1	2	4
Veronica arvensis	3	0	0	0	1	0	0


SAC 000500 Glenamoy Bog Complex
Petalophyllum ralfsii
Overview
ATLANTIC OCEAN
An tAigéan Atlantach
Legend
Petalophyllum ralfsii locations
SAC 000500
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 19th Feb 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 2.0


SAC 000500 Glenamoy Bog Complex
Petalophyllum ralfsii
Locality 7 Garter Hill
Legend
Campbell, Gaynor & Lockhart
Campbell, Lockhart & Smyth
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 19th Feb 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 2.0

Mullet/Blacksod Bay Complex SAC (IE000470)

Locality No. 8a: Doolough Machair, Co. Mayo; Grid ref. F736223

Field notes from Neil Lockhart (8 April 1998):

Circa 20 plants in an area of sandhills at the highest part of the plain, above a flushed calcareous slope to the SE. sandhill area grazed by cattle. Some fertiliser enrichment at the northern end. No ring feeders seen.

Field notes from David Holyoak (17 April 1999):

77 thalli counted. Lack or scarcity of recent grazing probably limits occurrence of *P. ralfsii*. Most slack habitats now have too tall vegetation cover. However, the site may have been grazed more in past (old cattle dung seen). Still grazed by rabbits.

Field notes from Neil Lockhart (27 April 2006):

3 plants seen on tightly cropped turf on sides of low sandhills. Site appears to be more or less unchanged since 1998, still grazed by cattle, and overall in very good condition, although localised damage around a ring feeder occurs in one area.

Associates:

Agrostis stolonifera
Aneura pinguis
Bellis perennis
Brachythecium rivulare
Bryoerythrophyllum recurvirostrum
Bryum algovicum var. *rutheanum*
Bryum sp.
Calliergonella cuspidata
Campyliadelphus chrysophyllus
Carex arenaria
Carex cf. *hirta*
Carex flacca
Ctenidium molluscum
Ditrichum gracile
Drepanocladus polygamus
Eurhynchium praelongum
Festuca rubra
Homalothecium lutescens
Leontodon autumnalis
Leontodon saxatilis
Lotus corniculatus
Luzula campestris
Lotus corniculatus
Luzula campestris
Pilosella officinarum
Plantago coronopus
Plantago lanceolata
Prunella vulgaris
Ranunculus bulbosus
Syntrichia ruralis
Trifolium repens


SAC 000470 Mullet/Blacksod Bay Complex
Petalophyllum ralfsii
Overview
Population 8a:
Doolough Machair
Population 8b:
Dooyork Machair
Legend
Petalophyllum ralfsii locations
SAC 000470
Bay
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 30th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 000470 Mullet/Blacksod Bay Complex
Petalophyllum ralfsii
Locality 8a Doolough Machair
Legend
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 30th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Mullet/Blacksod Bay Complex SAC (IE000470)

Locality No. 8b: Dooyork Machair, Co. Mayo; Grid ref. F737202

Field notes from Neil Lockhart (9 April 1998):

Six plants seen. Probably more widespread on site, but not frequent or abundant. Plants found on damp flats between low sandhills, which is unusual for *P. ralfsii*. The hills themselves tend to be too heathy in character, with lichens, *Thymus praecox*, *Frullania tamarisci*, etc.

Field notes from David Holyoak (17 April 1999):

None found.

Associates:

Agrostis stolonifera
Bellis perennis
Calliergonella cuspidata
Campyliadelphus elodes
Carex flacca
Carex panicea
Climacium dendroides
Ctenidium molluscum
Festuca rubra
Homalothecium lutescens
Leontodon autumnalis
Lophocolea bidentata
Lotus corniculatus
Plagiomnium elatum
Poa sp.
Prunella vulgaris
Ranunculus bulbosus
Selaginella selaginoides
Trifolium repens


SAC 000470 Mullet/Blacksod Bay Complex
Petalophyllum ralfsii
Locality 8b Dooyork Machair
Legend
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 30th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Inishkea Islands SAC (IE000507)

Locality No. 9: North Inishkea, Co. Mayo; Grid ref. F567233

Field notes from Neil Lockhart (29 July 1998):

Seven plants scattered at intervals along a well-worn sheep track traversing the lower edge of machair plain, *ca.* 100 m from the sea. Searched the machair plain and associated water tracks for *ca*. 2 hours, but only found plants along this sheep track. Plenty of other suitable habitat occurs, so *P. ralfsii* is probably more widespread. No threats identified.

Associates:

Bellis perennis
Brachythecium rutabulum
Carex flacca
Cerastium fontanum
Euphrasia sp.
Festuca rubra
Juncus articulatus
Juncus bulbosus
Leontodon autumnalis
Lotus corniculatus
Plantago coronopus
Plantago lanceolata
Poa annua
Prunella vulgaris
Ranunculus bulbosus


SAC 000507 Inishkea Islands
Petalophyllum ralfsii
Overview
Carrickduff
Carrickmoylenacurhoga
Carrigeen
Carrickawilt
Carricknaweelion
Inis Gé Thuaidh
Inishkea North
Carrickaport
Drumacappul
Doon Lough
Portnahaulia
Gubnacusha
Portnahilly
Inis Gé Theas
Inishkea South
Rusheen Island
Portseanbeg
Porteeneeragh
Portsalaghta
Carricksalia
Carrickfad
Carrickhire
Carrickgarma
Carrigeenabalia
Carricklaur
Carrickalaveen
Legend
Petalophyllum ralfsii locations
SAC 000507
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 19th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
0
395
790
1,580
Metres
N
Map Version 1.0


SAC 000507 Inishkea Islands
Petalophyllum ralfsii
Locality 9 North Inishkea
Legend
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 19th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
0
40
80
160
Metres
N
Map Version 1.0

Doogort Machair/Lough Doo SAC (IE001497)

Locality No. 10: Doogort Machair ('Achill Island'/Lough Nambrack/ Caraun Point), Co. Mayo; Grid ref. F702095

Field notes from Neil Lockhart (5 April 1998):

Four rosettes seen. Plenty of suitable sandhills about suggest a more widespread and scattered distribution. Plants occur on the side of a compacted, tightly grazed (sheep) sandhill, relatively dry compared to other sites. At least 1–1.5 m above water table. Fairly heavily grazed by sheep, which may be exacerbating natural wind erosion.

Field notes from David Holyoak (2003):

None found.

Field notes from Neil Lockhart (2 July 2006):

Habitat still present, still an area of eroded rounded dunes present - a lot of sheep and sheep dung. The vegetation appears to be slightly more rank than remembered from previous visit - quite a few spikes of *Cirsium vulgare* give it a more rank appearance - although the herb and bryophyte layer are still grazed tight and suitable niches for *P. ralfsii* exist. Too dry to find *P. ralfsii*.

Field notes from Christina Campbell & Neil Lockhart (15 October 2009):

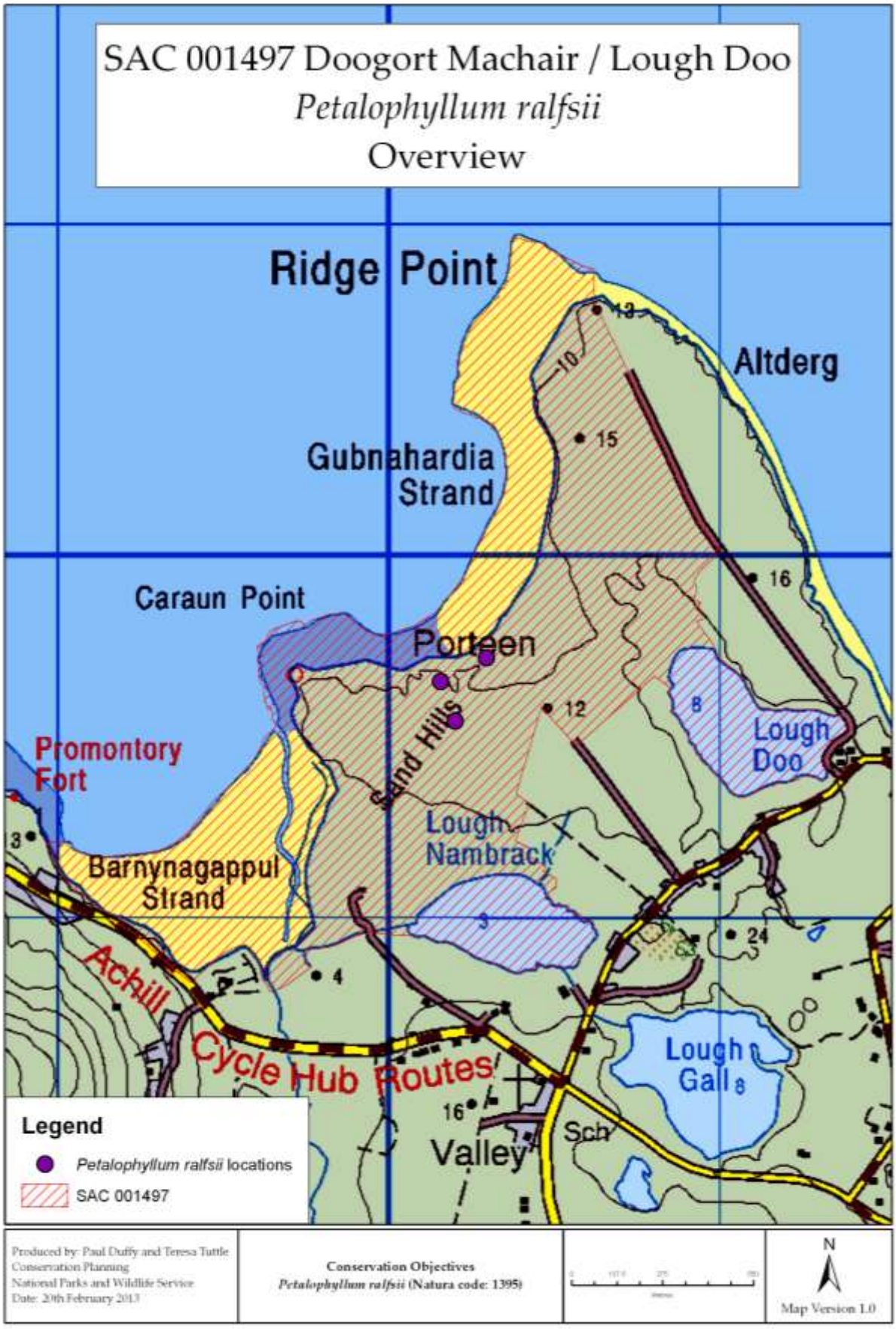
8 thalli (including one male and one female) were counted on a low hummock on machair *circa* 7 m alt.

Field notes from Christina Campbell & Neil Lockhart (21 October 2010):

43 thalli counted in area of 25 x 50 cm on machair.

Associates:

Achillea millefolium
Bellis perennis
Brachythecium albicans
Bryoerythrophyllum recurvirostrum
Bryum pseudotriquetrum
Carex flacca
Cerastium fontanum
Climacium dendroides
Cratoneuron filicinum
Didymodon vinealis
Ditrichum gracile
Festuca rubra
Galium verum
Hypnum cupressiforme
Hypochaeria radicata
Lophocolea bidentata
Lotus corniculatus
Luzula cf. *campestris*
Pilosella officinarum
Plagiomnium ellipticum
Plantago lanceolata
Poa sp.
Prunella vulgaris
Ranunculus bulbosus
Rhytidiadelphus squarrosus
Sagina procumbens
Trifolium repens


SAC 001497 Doogort Machair / Lough Doo
Petalophyllum ralfsii
Overview
Ridge Point
Altderg
Gubnahardia Strand
Caraun Point
Porteen
Sand Hills
Promontory Fort
Barnynagappul Strand
Lough Nambrack
Lough Doo
Lough Gall
Achill Cycle Hub Routes
Valley
Sch
Legend
Petalophyllum ralfsii locations
SAC 001497
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 20th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 001497 Doogort Machair / Lough Doo
Petalophyllum ralfsii
Locality 10 Doogort Machair
Legend
Campbell
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 20th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Keel Machair/Menaun Cliffs SAC (IE001513)

Locality No. 11: Keel Machair, Co. Mayo; Grid ref. F64_04_

Field notes from Neil Lockhart (6 April 1998):

Several hundreds, possibly thousands, of plants occur here. On tightly sheep-grazed turf on the edges of channelised and semi-natural water tracks on the western and more calcareous side of the machair plain. Part of this site is managed as a 9-hole pitch & putt course, low intensity management, with only the greens and tees re-seeded, has enabled *P. ralfsii* to survive. Any intensification or expansion should be discouraged.

Field notes from David Holyoak (17–19 April 1999):

Circa 430 thalli counted in total; overall population estimate high hundreds or low thousands. Soil and rubble had recently been tipped in one area. Westward extension of this tipping or its hydrological effects may damage *P. ralfsii*. Area is closely grazed by sheep but suffering damage over wide areas from vehicles driving over machair (resulting in compaction of surfaces), and mowing (or rolling?) for maintenance/creation of lawn-like golf course surfaces. Daily usage of off-road vehicle to exercise dogs on machair was seen.

Field notes from David Holyoak (28 June 2003):

Small, partly bare patches of damp unshaded sand in machair/dune-slacks with very short vegetation (heavily grazed by sheep). Hundreds of thalli at F64380470 and *ca*. 50 thalli at F64330479. Some sites are very close to an area used as a dump and at risk from being buried by rocks or rubbish placed there. Elsewhere drainage and fertiliser applications are the greatest threats.

Field notes from Neil Lockhart (7 July 2006):

Habitat much as described previously – still lots of available niches, still heavily grazed by sheep etc. Plants seen (> 20) beside old drainage system at F6457504520, but poor time of year for survey. More *P. ralfsii* (20–30 plants) in turf amongst compacted stones behind shingle at F6471804321. All plants extremely small at this time of year.

Associates:

Agrostis stolonifera
Aneura pinguis
Barbula convoluta
Bellis perennis
Brachythecium cf. *rivulare*
Bryoerythrophyllum recurvirostrum
Bryum pseudotriquetrum
Bryum sp.
Callerigonella cuspidata
Campylium stellatum
Carex arenaria
Didymodon fallax
Didymodon cf. *vinealis*
Distichium inclinatum
Drepanocladus polygamus
Euphrasia tetraquetra
Festuca rubra
Fissidens taxifolius
Juncus articulatus
Leontodon autumnalis
Linum catharticum
Plagiomnium ellipticum
Plantago coronopus
Poa annua
Potentilla anserina
Prunella vulgaris
Sagina procumbens
Scorpidium revolvens
Selaginella selaginoides
Trifolium repens


SAC 001513 Keel Machair / Menaun Cliffs
Petalophyllum ralfsii
Overview
Legend
Petalophyllum ralfsii locations
SAC 001513
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 20th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 001513 Keel Machair / Menaun Cliffs
Petalophyllum ralfsii
Locality 11 Keel Machair
Legend
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 20th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Mweelrea/Sheeffry/Erriff Complex SAC (IE001932)

Locality No. 12: Dooaghtry (Lackakeely/Killadoon)), Co. Mayo; Grid ref. L750690 etc.

Field notes from Neil Lockhart (25 November 1997):

At least 50 plants seen over 3 locations about 200 m apart. Area not extensively searched, but similar suitable habitat appears to be extensive around the edge of the flat plain. Growing with a turf of mosses. No threats at present.

Field notes from David Holyoak & Neil Lockhart (20 April 1999):

Hundreds of thousands (L750690). Whole area grazed heavily by sheep, and rabbits occur, giving open sward 1–3 cm tall; continued grazing essential for *P. ralfsii*.

Field notes from David Holyoak (11 July 2003):

4 scattered thalli seen at L74426881 on damp unshaded sand among sparse low grasses, sedges and herbs, on base of north-facing machair slope. Heavily grazed by sheep.

Field notes from Neil Lockhart (5 July 2006):

Site essentially in similar condition to when last visited – sheep-grazed machair – very good condition. *P. ralfsii* easily relocated in tractor wheel ruts at L7507068525, and some more at L7536968719, at the side of an old eroded sandhill.

Associates:

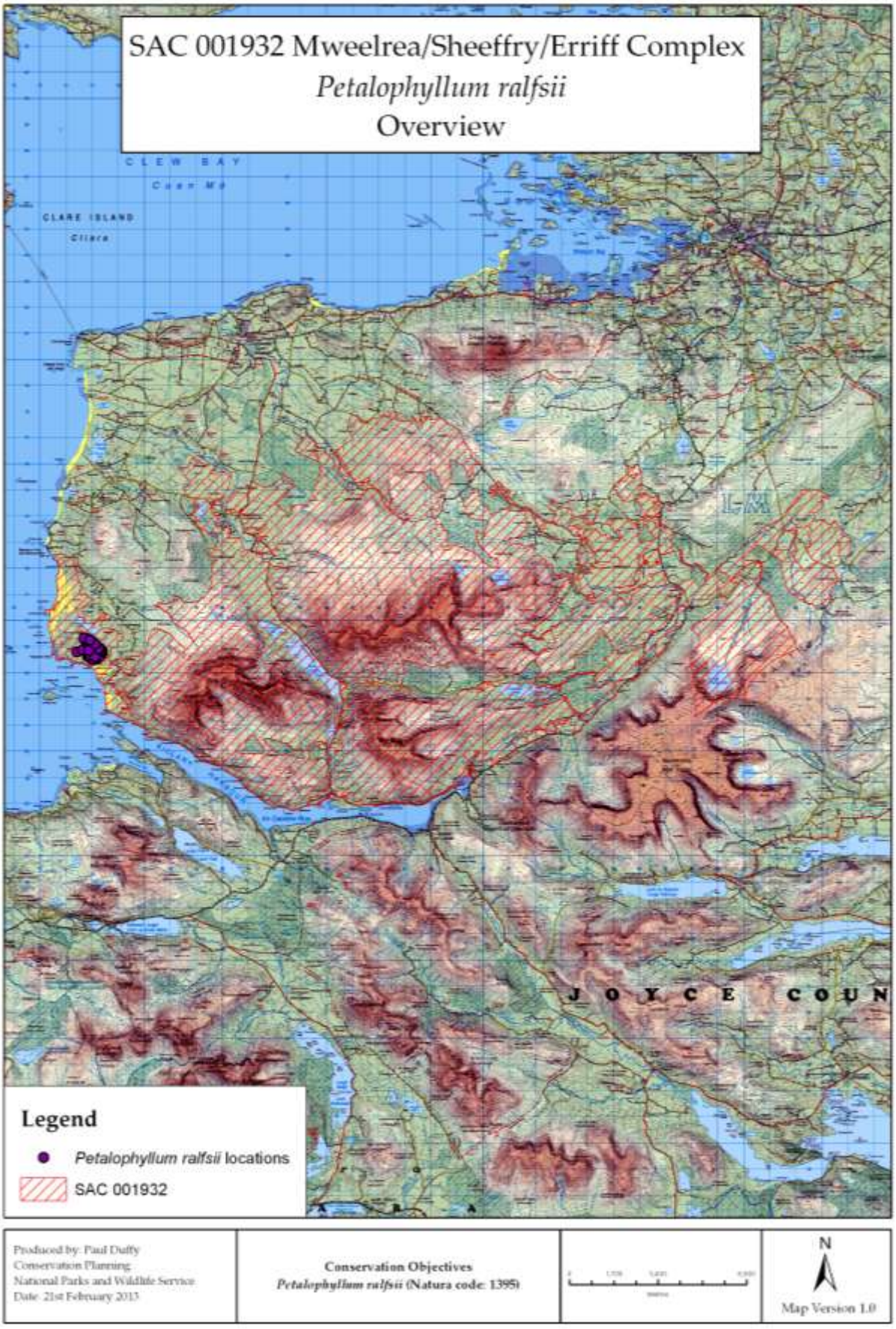
Achillea millefolium
Agrostis stolonifera
Amblystegium serpens
Aneura pinguis
Bellis perennis
Brachythecium mildeanum
Bryum algovicum var. *rutheanum*
Bryum pallens
Bryum pseudotriquetrum
Calliergonella cuspidata
Carex flacca
Cerastium fontanum
Cratoneuron filicinum
Didymodon vinealis
Ditrichum gracile
Euphrasia sp.
Festuca rubra
Homalothecium lutescens
Juncus bulbosus
Jungermannia atrovirens
Leontodon autumnalis
Plantago coronopus
Plantago lanceolata
Poa sp.
Pohlia sp.
Prunella vulgaris
Riccardia chamedryfolia
Sagina procumbens
Scorpidium revolvens
Syntrichia ruralis
Thymus polytrichus
Trifolium repens

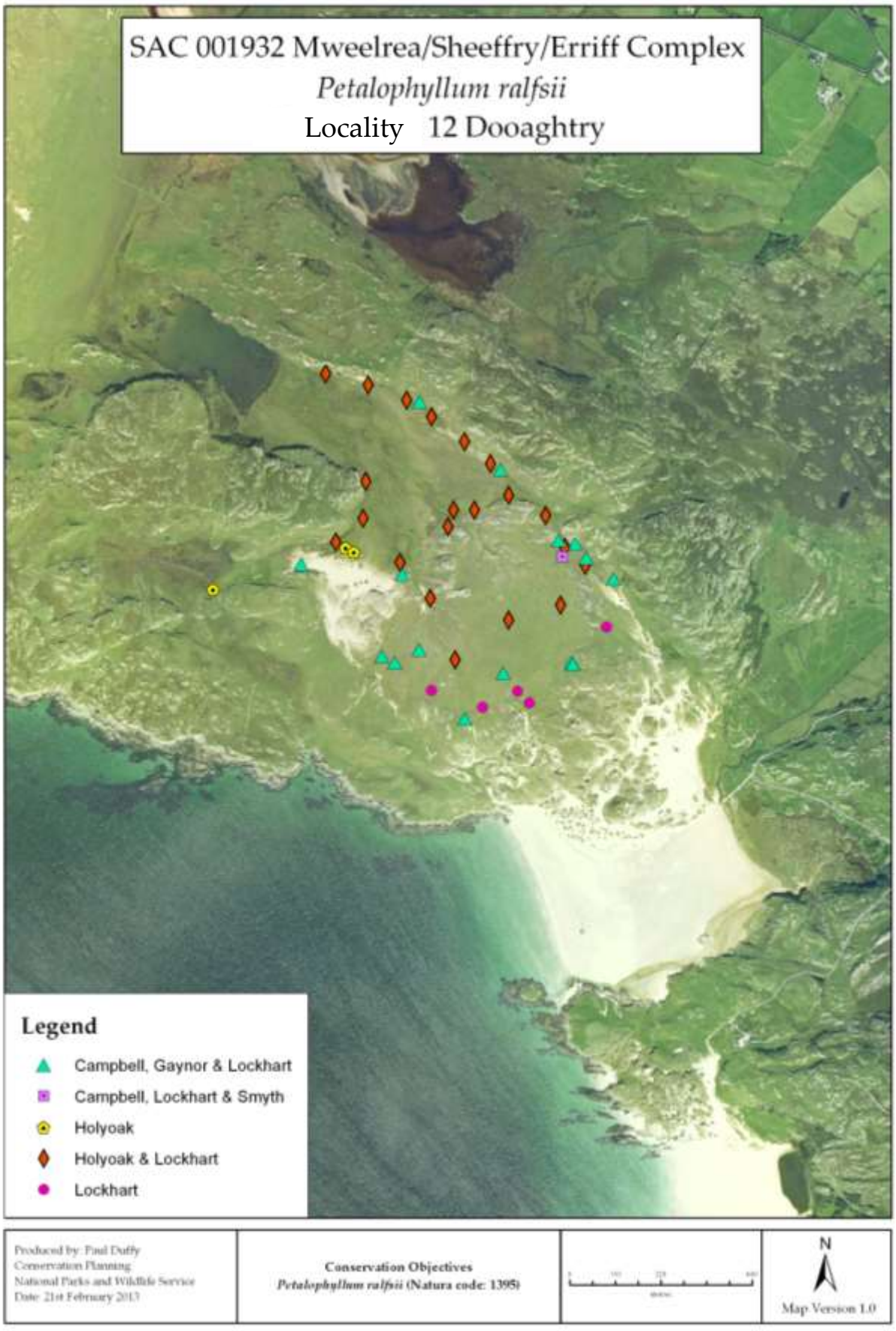
Field notes from Christina Campbell, Karen Gaynor, Neil Lockhart & Noeleen Smyth (13 May 2009 & 20 April 2010):

Five plots (25 x 50 cm) were recorded on flat machair plain, on the side of low sandy hummocks and in flushed machair. The area is grazed by sheep and rabbits and maintenance of this regime is essential for the continued presence of *P. ralfsii*. Details of five 25 x 50 cm plots recorded are below.

Dooaghtry	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Year	2009	2009	2009	2009	2010
Distance from sea (m)	413	234	323	374	659
Altitude (metres above sea level)	21	23	17	18	17.5
Slope (degrees)	15	4	0	0	5
Aspect	South-west	North	-	-	South
Soil depth (cm)	3	6	2	2	4.5
Soil pH	8.12	8.19	8.09	8.19	8
Depth to groundwater (cm)	15 to bedrock	70	64	59	49.5
Groundwater pH	NA	7.2	7.21	7.19	7.37
Groundwater conductivity (µS/cm)	NA	699	688	619	575
Number of *P. ralfsii* thalli	11	3	8	16	4
Mean vegetation height (cm)	2.2	2.6	3.0	2.3	2.0
Maximum vegetation height (cm)	3	5	5	4	3
Cover (Domin):					
Total cover	9	9	10	9	10
Shrub cover	0	0	0	0	0
Rush cover	+	4	0	0	1
Grass cover	5	4	6	7	4
Sedge cover	5	3	4	2	5
Forb cover	6	5	4	4	5
Fern/ fern allies cover	0	0	0	0	2
Bryophyte cover	8	8	9	8	9
Litter cover	3	4	4	5	4
Bare soil cover	3	5	2	4	0
Dung cover	2	1	+	3	1
Agrostis stolonifera	1	3	1	0	0
Amblystegium serpens var. *salinum*	1	0	1	0	0
Anagallis tenella	0	0	0	0	1
Aneura pinguis	4	0	0	0	4
Barbula convoluta	1	4	3	0	0
Bellis perennis	4	4	2	1	3
Brachythecium albicans	4	4	5	0	0
Brachythecium mildeanum	0	0	0	0	2
Bryum algovicum	4	0	4	1	0
Bryum pseudotriquetrum	3	4	0	4	0
Bryum sp.	0	0	0	0	3
Calliergonella cuspidata	0	3	0	0	0
Carex arenaria	0	0	3	2	0
Carex flacca	5	2	3	0	5
Centaurium erythraea	0	0	0	+	0
Cerastium fontanum	2	0	0	1	0
Ctenidium molluscum	0	0	3	1	0
Didymodon fallax	4	5	4	3	0
Distichium inclinatum	0	0	1	4	0
Ditrichum gracile	0	0	5	4	4
Entodon concinnus	3	0	0	0	0
Equisetum variegatum	0	0	0	0	1

Dooaghtry (continued)	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Erophila verna	0	0	1	1	0
Euphrasia sp.	+	1	1	1	0
Festuca rubra	5	2	6	7	4
Holcus lanatus	0	0	1	0	0
Hydrocotyle vulgaris	0	0	0	0	2
Juncus acutiflorus	0	4	0	0	0
Juncus articulatus	+	4	0	0	1
Jungermannia atrovirens	0	0	0	0	8
Leontodon saxatilis	4	0	+	+	2
Linum catharticum	0	0	0	3	0
Lophocolea bidentata	2	0	4	0	0
Lotus corniculatus	0	0	2	0	0
Luzula campestris	0	0	+	1	0
Pellia endiviifolia	4	0	0	0	0
Plagiochila asplenioides	0	0	2	0	0
Plantago coronopus	5	4	2	4	3
Plantago lanceolata	0	0	1	0	0
Pleurochaete squarrosa	2	2	0	0	0
Pohlia wahlenbergii	1	0	0	0	4
Rhytidiadelphus squarrosus	0	4	0	0	0
Sagina procumbens	+	3	1	1	2
Saxifraga tridactylites	1	0	4	2	0
Scorpidium revolvens	0	0	0	0	4
Selaginella selaginoides	0	0	0	0	1
Trichostomum brachydontium	0	0	1	2	0
Trifolium dubium	0	0	1	0	0
Trifolium repens	3	1	0	0	+


SAC 001932 Mweelrea/Sheeffry/Erriff Complex
Petalophyllum ralfsii
Overview
CLEW BAY
CLARE ISLAND
JOYCE COUN
Legend
Petalophyllum ralfsii locations
SAC 001932
Produced by: Paul Duffy
Conservation Planning
National Parks and Wildlife Service
Date: 21st February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 001932 Mweelrea/Sheeffry/Erriff Complex
Petalophyllum ralfsii
Locality 12 Dooaghtry
Legend
Campbell, Gaynor & Lockhart
Campbell, Lockhart & Smyth
Holyoak
Holyoak & Lockhart
Lockhart
Produced by: Paul Duffy
Conservation Planning
National Parks and Wildlife Service
Date: 21st February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Omey Island Machair SAC (IE001309)

Locality No. 13: Omey Island Machair, Co. Galway; Grid ref. L56_55_

Field notes from Neil Lockhart (8 October 1998):

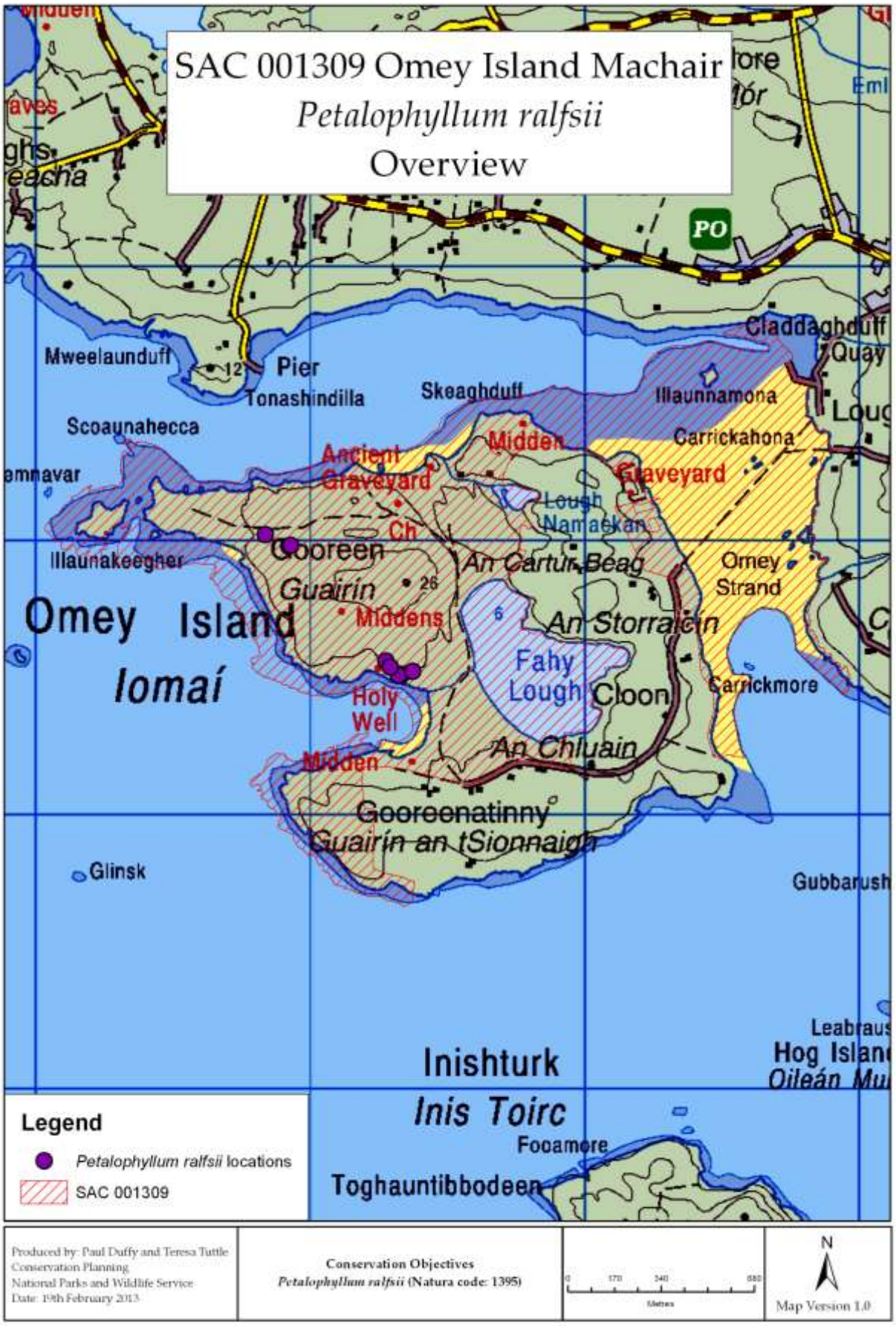
Two populations close to each other, one (R1) of 4 plants in 2 colonies, the other (R2) of *ca.* 300 along a compacted trackway for a distance of *ca*. 10 m. Plants (R1) occur in a flat, wet basin which seasonally floods with peaty calcareous sand. Area has been disturbed in the past by vehicle wheel tracks and some poaching by cattle which has exposed bare sandy peat. No threats - occasional disturbance may benefit *P. ralfsii*. Currently grazed by cattle and rabbits. R2: several rosettes growing in the wheel ruts of a trackway across the machair. Ground very compressed with patches of Pottiaceae-dominated open ground. Only threat is from lack of vehicle usage. Maintain usage to compact soil and retain open ground.

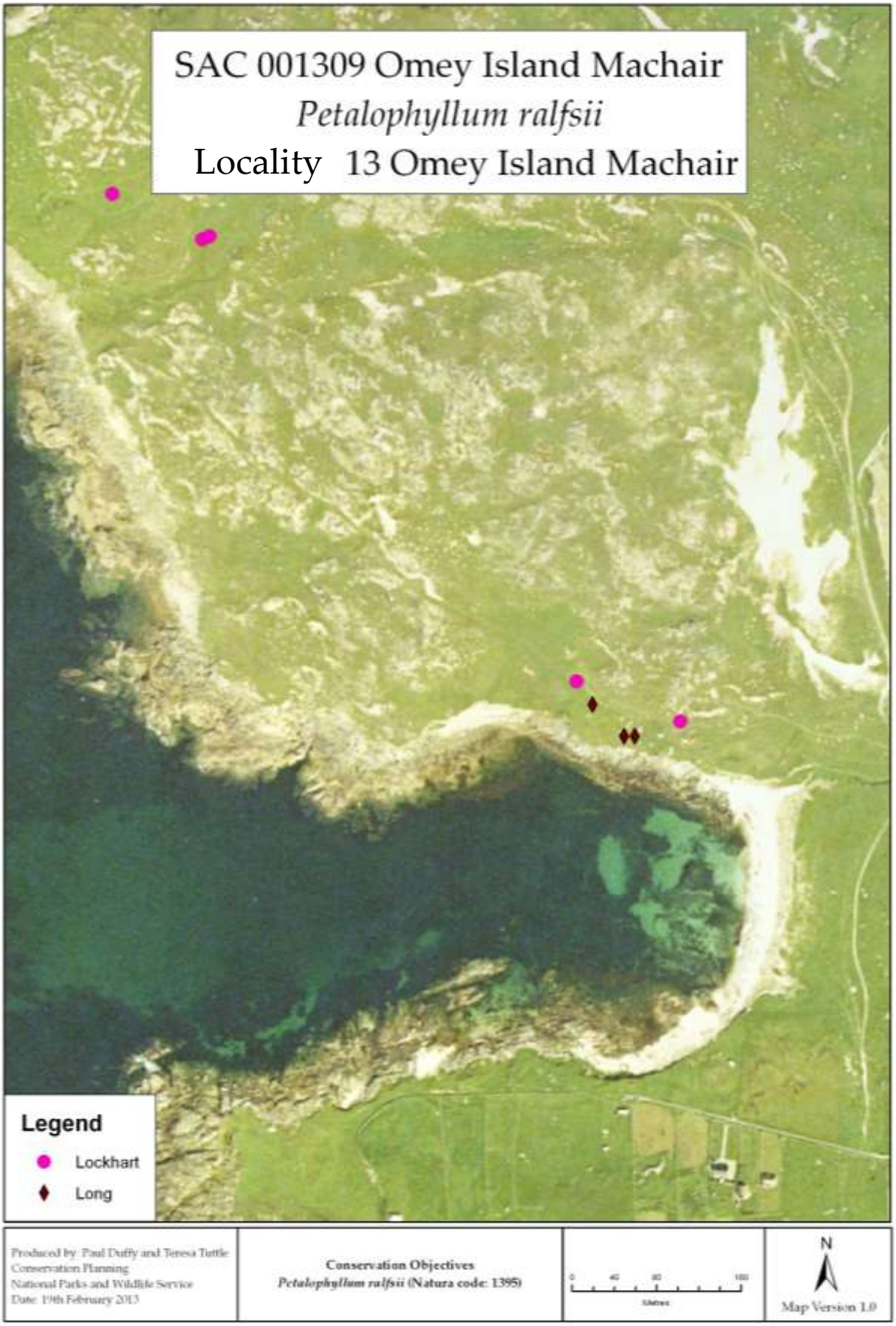
Field notes from Neil Lockhart (3 November 2006):

Refound NL's R2 after a few minutes searching. Track is a bit scuffed up by cattle hooves in places, but *P. ralfsii* seen at L5637355524, in same place as in 1998. Just 5 plants counted, but suitable compacted ground occurs in the vicinity. Overall, the site is much as it was in 1998. Refound R1 after 1 minute search. Habitat exactly as described in 1998. *P. ralfsii* found where vehicle tracks cross wet plain at L5592755983, just 1 plant.

Associates:

Agrostis stolonifera
Anagallis tenella
Aneura pinguis
Barbula convoluta
Bellis perennis
Brachythecium rutabulum
Bryum pseudotriquetrum
Calliergonella cuspidatum
Campylium stellatum
Carex flacca
Carex arenaria
Ctenidium molluscum
Cynosurus cristatus
Didymodon fallax
Didymodon ferrugineus
Ditrichum gracile
Festuca rubra
Fissidens celticus
Fissidens dubius
Galium verum
Gentianella campestris
Juncus acutiflorus
Juncus cf. *bufonius*
Leontodon autumnalis
Lotus corniculatus
Moerckia flotoviana
Pellia endiviifolia
Plantago coronopus
Plantago lanceolata
Poa sp.
Polygala cf. *serpyllifolia*
Potentilla anserine
Prunella vulgaris
Pseudocrossidium hornschuchianum
Ranunculus bulbosus
Rhytidiadelphus squarrosus
Riccardia chamedryfolia
Sedum acre
Selaginella selaginoides
Trifolium repens


SAC 001309 Omey Island Machair
Petalophyllum ralfsii
Overview
Mweelaunduff
Pier
Tonashindilla
Skeaghduff
Claddaghduff
Quay
Illaunnamona
Scoaunahecca
Ancient
Graveyard
Midden
Carrickahona
Graveyard
Lough
Namaekan
Ch
Illaunakeegher
Gooreen
An Cartún Beag
Omey
Strand
Guairín
26
Middens
Omey Island
Iomaí
An Storraicín
Fahy
Lough
Cloon
Carrickmore
Holy
Well
An Chluain
Midden
Gooreenatinny
Guairín an tSionnaigh
Glinsk
Gubbarush
Leabraus
Hog Islan
Oileán Mu
Inishturk
Inis Toirc
Fooamore
Toghauntibbodeen
Legend
Petalophyllum ralfsii locations
SAC 001309
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 19th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
0
170
340
680
Metres
N
Map Version 1.0


SAC 001309 Omey Island Machair
Petalophyllum ralfsii
Locality 13 Omey Island Machair
Legend
Lockhart
Long
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 19th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Slyne Head Peninsula SAC (IE002074)

Locality No. 14a: Mannin More, Co. Galway; Grid ref. L607460

Field notes from David Holyoak (16 May 2004):

Thirteen thalli seen, but habitat extensive and likely to be hundreds, if not thousands. On unshaded, damp calcareous sand with sparse low (< 5 cm) vegetation on machair slope; area closely grazed, mainly by sheep.

Field notes from Neil Lockhart (29 October 2006):

P. ralfsii seen at L6070846080: 24 plants per square metre over a suitable area of *ca.* 100 x 20 m = 48,000 plants. More plants seen a few hundred metres further west, walking along the coast, *ca*. 100 m in from the sea. In damp depressions at L6062746274, alt. 11 m - 12 plants in area 4 x 3 m - undoubtedly more, but only searched for 2 minutes. More plants at L6062646313 in a semi-circular depression just 30–40 m further west, *ca.* 40 m from sea: *ca*. 32,000 plants. Plants also seen on trackway immediately west of depression at L6061346373. Yet more plants amongst machair grassland further west at L6048646412 - 3 plants. Overall the site condition here is very good for *P. ralfsii*, grazed by sheep, rabbits and hares. Also a good time of year to survey - two very large populations seen: the first a confirmation of David Holyoak's record, the second a new one. Further survey would probably reveal yet more!

Associates:

Aneura pinguis
Calliergonella cuspidata
Carex panicea
Didymodon tophaceus
Distichium inclinatum
Festuca rubra
Galium verum
Leontodon saxatilis
Leiocolea badensis
Lotus corniculatus
Prunella vulgaris
Trichostomum brachydontium


SAC 002074 Slyne Head Peninsula
Petalophyllum ralfsii
Overview
Clifden Bay
Cuan an Chlochain
MANNIN BAY
Cuan Mhanainn
Population 14b: Truska Machair
Population 14a: Mannin More
Population 14c: Doon Hill/ West of Aillebrack
Ballyconneely Bay
Cuan Shalla Conaola
Legend
Petalophyllum ralfsii locations
SAC 002074
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 29th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 002074 Slyne Head Peninsula
Petalophyllum ralfsii
Locality 14a Mannin More
Legend
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 29th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Slyne Head Peninsula SAC (IE002074)

Locality No 14b: Truska Machair, Co. Galway; Grid ref. L585458

Field notes from Neil Lockhart (6-7 October 1998 [with Noel Kirby, Ger O'Donnell & Marie-Louise Heffernan]):

Flat, extensive machair plain sloping gently to NE. Seasonally flooded, but water-table currently below surface and ground is damp. Heavily grazed by a mixture of cattle and sheep. Found a small population, *ca*. 50 plants, on wheel ruts beside road on entering the machair plain. Another, more extensive and natural population was seen on damp, seasonally flooded ground at the edge of sedge/reed swamp on the Truska/Mannin Beg townland boundary. Several hundred plants were seen here. The main Truska machair plain supported the largest single population yet seen in Ireland. The number must range from 750,000 to 2.4 million. Not currently threatened, although sand extraction occurs locally. Current grazing regime appears beneficial for *P. ralfsii*.

Field notes from David Holyoak & Neil Lockhart (21–22 April 1999):

Population 6 (L583459) very large, covering area paced as 425 x 50–80 m, density 200 and 303 thalli in two 1 m squares: overall population *ca*. 5.5 million or more. All other populations much smaller: 4 (L584453), 5 (L587461), 7, 8, 9 all 1–3 thalli. Current heavy grazing by sheep evidently good for *P. ralfsii*. Some rutting caused by off-road vehicles, but no serious problems apparent.

Field notes from David Holyoak (11 May 2004):

Partly bare damp sand of extensive slack in machair, receiving blown sand from low bank to north; many thousands of square metres of habitat for *P. ralfsii* in vicinity. Many thousands of thalli. Potentially at risk from erosion if stocking levels increase, or from shading and vegetation succession if grazing declines.

Field notes from Neil Lockhart (2 November 2006):

20 plants per m^2. Further plants seen along the length of the flat depression, but at much lower densities (< 10 per m^2). Far less extensive patches than in 1998 and 1999. There appears to be less open ground, less *Moerckia*, and more *Festuca rubra*. This may be a natural succession, or there may be less sheep grazing. *P. ralfsii* is still relatively common, though not abundant. Lots of *P. ralfsii* in flat-bottomed depression at L5811945620, alt. 12 m, with *M. hibernica*, in open compacted wet turf. This is much more as Truska machair was in 1998/99. Estimate of 150 plants per square metre in patches over an area of *ca*. 20 x 60 m (150 x 1200 = 180,000 plants, or probably somewhat less because of the patchiness, but maybe 100,000). A further population seen in wet ground, below main population, where water channel enters the sea at L5801545692 - *ca*. 15,000 plants.

Associates:

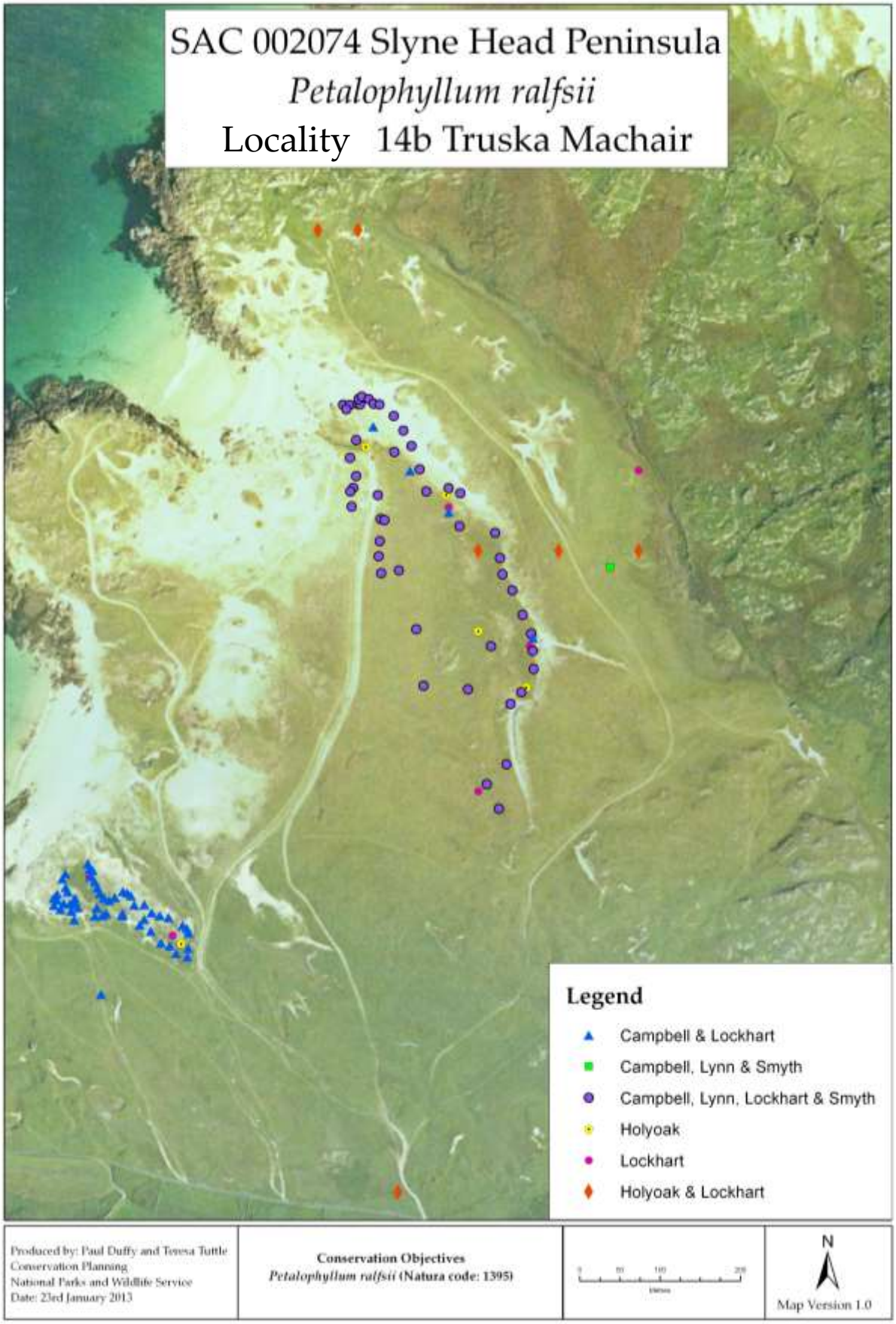
Agrostis stolonifera
Amblyodon dealbatus
Amblystegium serpens
Anagallis tenella
Aneura pinguis
Barbula convoluta
Bellis perennis
Brachythecium rutabulum
Bryum cf. *algovicum*
Bryum pseudotriquetrum
Calliergonella cuspidata
Campylium stellatum
Cardamine pratensis
Carex arenaria
Carex flacca
Cerastium sp.
Cratoneuron filicinum
Didymodon fallax
Didymodon ferrugineus
Didymodon tophaceus
Distichium inclinatum
Festuca rubra
Homalothecium lutescens
Iris pseudocorus
Juncus acutiflorus
Linum catharticum
Moerckia flotoviana
Plantago coronopus
Plantago lanceolata
Poa annua
Pohlia sp.
Ranunculus cf. *bulbosus*
Riccardia chamedryfolia
Sagina procumbens
Thuidium recognitum
Trifolium repens

Field notes from Christina Campbell, Neil Lockhart, Deirdre Lynn & Noeleen Smyth (17-19 February 2009, 24 March 2010 & 10 March 2011):

The largest sub-population (Truska sub-population 1) occurs on the main Truska machair plain that is bordered to the north and north-west by a sand ridge. This area appears to be seasonally flooded in parts, receives in-blown sand from the ridge and is grazed by cattle and sheep. Nine plots (25 x 50 cm) containing *P. ralfsii* were recorded along two transects extending from the sea through the area of occupancy. The second largest sub-population (sub-population 2) occurs in a damp and seasonally flooded area to the south-west of the main area of occupancy. Seven plots (25 x 50 cm) were recorded here. A single thallus was found in area further north of the main sub-population in 2011 and a plot was recorded here. The area is under commonage and maintenance of the grazing regime is essential for *P. ralfsii* here. Some rutting by off-road vehicles was visible. Details of sixteen 25 x 50 cm plots recorded are below.

Truska Machair	**Sub-population 1 plots (25 x 50 cm)**									**Sub-population 2 plots (25 x 50 cm)**						**Sub-population 3**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Year	’09	’09	’09	’09	’09	’10	’10	’10	’10	’10	’10	’10	’10	’10	’10	’11
Distance from sea (m)	217	107	181	413	156	146	208	276	438	281	224	196	166	136	116	463
Altitude (metres above sea level)	6.42	2.14	6.09	6.92	6.34	2.81	4.24	10.21	9.36	8.38	7.29	8.3	5.32	4.99	7.52	0.14
Slope (degrees)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Aspect	-	-	-	-	-	-	-	-	-	West	-	-	-	-	-	0
Soil depth (cm)	1.0	0.5	1.5	4.0	0.5	2.5	3.0	4.0	2.0	3.0	4.0	4.0	4.0	2.0	3.0	3
Soil pH	8.05	7.96	7.95	7.61	7.97	8.00	7.88	7.85	7.85	7.91	8.14	8.02	7.86	7.90	7.95	7.84
Depth to groundwater (cm)	36	20	27	12	36	24	27	20	12	11	14	16	17	25	24	20
Groundwater pH	7.34	7.11	7.22	7.26	7.21	7.27	7.26	7.25	7.13	7.24	6.89	6.96	6.88	7.39	7.66	7.18
Groundwater conductivity (µS/cm)	671	802	778	701	650	612	604	582	806	588	698	602	715	600	459	582
Number of thalli	23	59	24	2	33	43	25	5	3	5	1	5	2	18	17	1
Mean vegetation height (cm)	4.0	6.5	6.0	3.5	3.0	3.0	2.5	2.4	1.8	2.4	1.6	3.2	2.5	3.0	3.2	1.83
Maximum vegetation height (cm)	5.8	7.0	7.0	7.0	7.0	12	5.5	4.0	7.0	4.5	3.5	6.0	3.5	12.0	5.5	3.5
Cover (Domin):																
Total cover	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	8
Rush cover	0	4	+	1	0	2	1	1	1	0	+	+	0	0	0	3
Grass cover	6	1	4	7	3	5	6	4	4	6	6	6	5	4	2	5
Sedge cover	1	5	2	5	2	+	2	1	4	1	0	5	5	6	7	7
Forb cover	5	8	6	4	6	5	3	4	5	4	5	4	2	4	4	5
Bryophyte cover	8	5	5	8	7	8	9	9	9	8	8	9	8	8	7	7
Algae cover	0	2	0	0	2	+	+	+	0	0	+	0	0	0	+	0
Litter cover	8	4	4	4	4	4	5	5	3	7	5	6	7	6	4	7
Bare soil cover	4	4	5	1	6	4	+	1	+	4	4	+	2	+	4	5
Dung cover	1	+	+	0	0	2	1	0	1	0	0	0	0	+	+	0
Agrostis stolonifera	1	2	2	4	2	5	1	1	0	4	1	4	2	3	+	2
Amblystegium serpens var. *salinum*	1	0	0	0	0	1	3	6	0	0	1	0	0	2	4	3
Aneura pinguis	0	0	1	6	0	4	0	0	1	3	1	2	3	1	4	4
Barbula convoluta	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Bellis perennis	5	5	5	3	4	2	1	2	4	0	+	+	+	+	2	4
Brachythecium mildeanum	+	1	1	0	1	1	5	4	4	0	4	0	0	0	1	4
Bryum pseudotriquetrum	0	0	0	1	0	3	0	0	6	4	2	3	+	0	2	4

Truska Machair (continued)	**Sub-population 1 plots (25 x 50 cm)**									**Sub-population 2 plots (25 x 50 cm)**						**Sub-population 3**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Bryum sp.	0	1	0	0	0	0	2	3	0	0	0	0	0	0	0	0
Calliergonella cuspidata	0	0	0	5	0	0	0	1	2	5	4	3	+	0	2	4
Carex arenaria	+	5	2	0	2	+	2	1	1	1	0	+	0	4	1	0
Carex flacca	0	0	0	5	0	0	0	0	4	0	0	5	5	5	7	7
Cerastium fontanum	1	0	1	0	2	+	+	+	0	0	0	0	+	0	0	0
Didymodon fallax	4	0	4	1	6	5	5	4	0	5	5	4	3	5	5	0
Ditrichum gracile	0	0	0	0	0	0	0	0	0	3	0	2	0	0	0	0
Festuca rubra	6	1	4	7	1	1	6	4	4	6	6	6	5	3	2	5
Homalothecium lutescens	2	0	0	0	0	0	0	0	0	0	0	2	+	0	0	2
Hypnum cupressiforme	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Juncus acutiflorus	0	0	0	0	0	2	1	1	1	0	+	+	0	0	0	0
Juncus articulatus	0	4	+	1	0	0	0	0	4	0	0	0	0	0	0	3
Leontodon autumnalis	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	1
Lophocolea bidentata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Lotus corniculatus	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Luzula multiflora	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moerckia flotoviana	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Nostoc sp.	0	2	0	0	2	+	+	+	0	0	+	0	0	0	+	0
Plantago coronopus	1	8	5	0	4	4	+	2	1	+	0	2	+	4	4	1
Plantago lanceolata	0	2	+	0	+	+	1	1	0	0	1	+	+	1	+	0
Prunella vulgaris	0	0	0	0	0	+	0	+	0	0	1	0	0	0	0	4
Ranunculus bulbosus	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Ranunculus repens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Rhytidiadelphus squarrosus	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Riccardia multifida	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0
Sagina procumbens	1	4	2	0	1	2	+	+	+	0	2	1	0	0	1	0
Thymus praecox	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Syntrichia ruralis var. *ruraliformis*	+	0	0	0	1	0	1	0	2	0	0	2	+	1	0	0
Trifolium repens	4	2	1	2	1	1	2	+	1	3	3	+	1	1	+	4


SAC 002074 Slyne Head Peninsula
Petalophyllum ralfsii
Locality 14b Truska Machair
Legend
Campbell & Lockhart
Campbell, Lynn & Smyth
Campbell, Lynn, Lockhart & Smyth
Holyoak
Lockhart
Holyoak & Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 23rd January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Slyne Head Peninsula SAC (IE002074)

Locality No. 14c: Doon Hill/ W. of Aillebrack, Co. Galway; Grid ref. L58_42_

Field notes from Neil Lockhart (10 November 1997):

Found several (*ca*. 30) plants on the side of old wheel ruts on damp calcareous sand, with open moss-dominated vegetation.

Field notes from Neil Lockhart (6 October 1998 [with Noel Kirby, Ger O'Donnell & Marie-Louise Heffernan]):

Still many (probably > 100) plants on wheel ruts. Found two further populations on wheel ruts to the north-west, also on Aillebrack machair. Probably at least > 100 plants in each.

Field notes from David Holyoak & Neil Lockhart (21–22 April 1999):

Extensive damage due to vehicles over large areas. This site is also under-grazed, mainly by cattle. Sheep-grazing could improve the habitat for *P. ralfsii*. Population 2 (L580428): 1–3 thalli; population 3 (L581429): 11 thalli; population 1 (L583425) not seen.

Field notes from David Holyoak (10 May 2004):

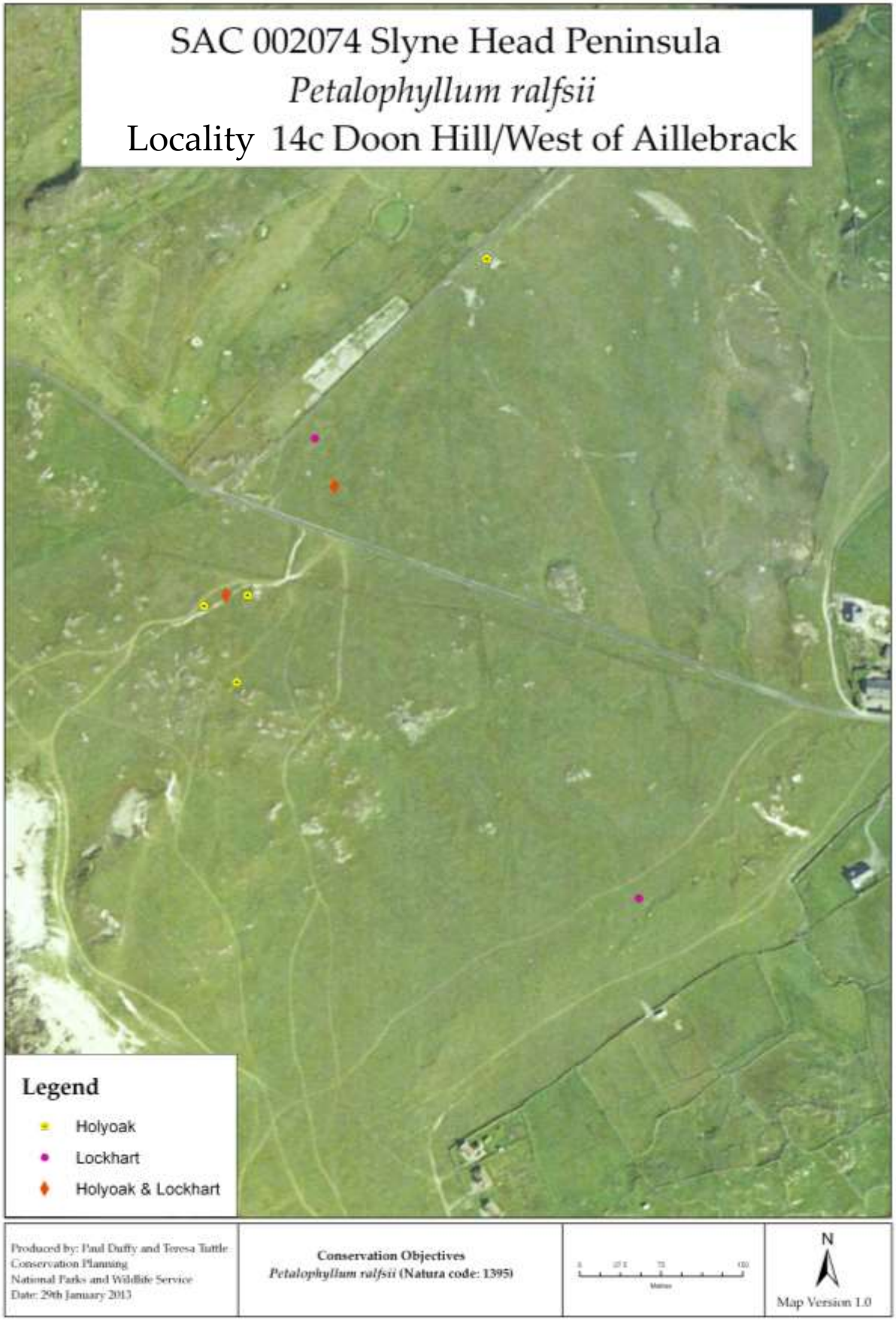
On partly bare, damp calcareous sand in small hollows in machair. Mainly occurs where machair surface disturbed, e.g. in old wheel ruts. Machair heavily grazed, mostly by sheep. Four colonies of 4, 6, 1 & 7 thalli respectively. Doubtless occurs elsewhere. Repeated disturbance of machair surface provides niches for *P. ralfsii*, but too much erosion or vehicle traffic may be deleterious. Reduction in present heavy grazing may be deleterious to it.

Field notes from Neil Lockhart (30 October 2006):

Habitat still in good condition. Found *P. ralfsii* at L58082/42944, alt. 11 m, in very compacted turf of wheel ruts. This corresponds to population 3 on the 1:50,000 map. Not very common, only 2 plants seen after quick search.

Associates:

Aneura pinguis
Bellis perennis
Bryum pseudotriquetrum
Calliergonella cuspidata
Carex panicea
Cratoneuron filicinum
Leontodon saxatilis
Pellia endiviifolia
Plantago coronopus
Plantago lanceolata


SAC 002074 Slyne Head Peninsula
Petalophyllum ralfsii
Locality 14c Doon Hill/West of Aillebrack
Legend
Holyoak
Lockhart
Holyoak & Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 29th January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Murvey Machair SAC (IE002129)

Locality No. 15: Murvey Machair, Co. Galway; Grid ref. L661391

Field notes from Neil Lockhart (5 October 1998):

One population of *P. ralfsii* on flushed sloping bank of rocky outcrop found during a preliminary visit in June 1998. Estimated 20–30 plants. Revisited site on 5 October 1998 to record a relevé, but could only relocate one plant at this original site. Found a second population a few hundred metres to the north and recorded a relevé, but only 3–4 plants seen here. No threats at present. Site is currently grazed by sheep. Some erosion, but not a threat.

Field notes from David Holyoak (22 April 1999):

Three thalli at L661391, 35 thalli at L661392, the counts surprisingly low in view of the large extent of apparently suitable habitat. Site has considerable extent of good, closely sheep-grazed machair with damp hollows. Tufa is being deposited in flushes and on slopes. The moss *Hymenostylium recurvirostrum* forms large patches on some slopes. No threats apparently; intense sheep-grazing here probably favours *P. ralfsii*; wheel-rutting from vehicles.

Field notes from David Holyoak (9 May 2004):

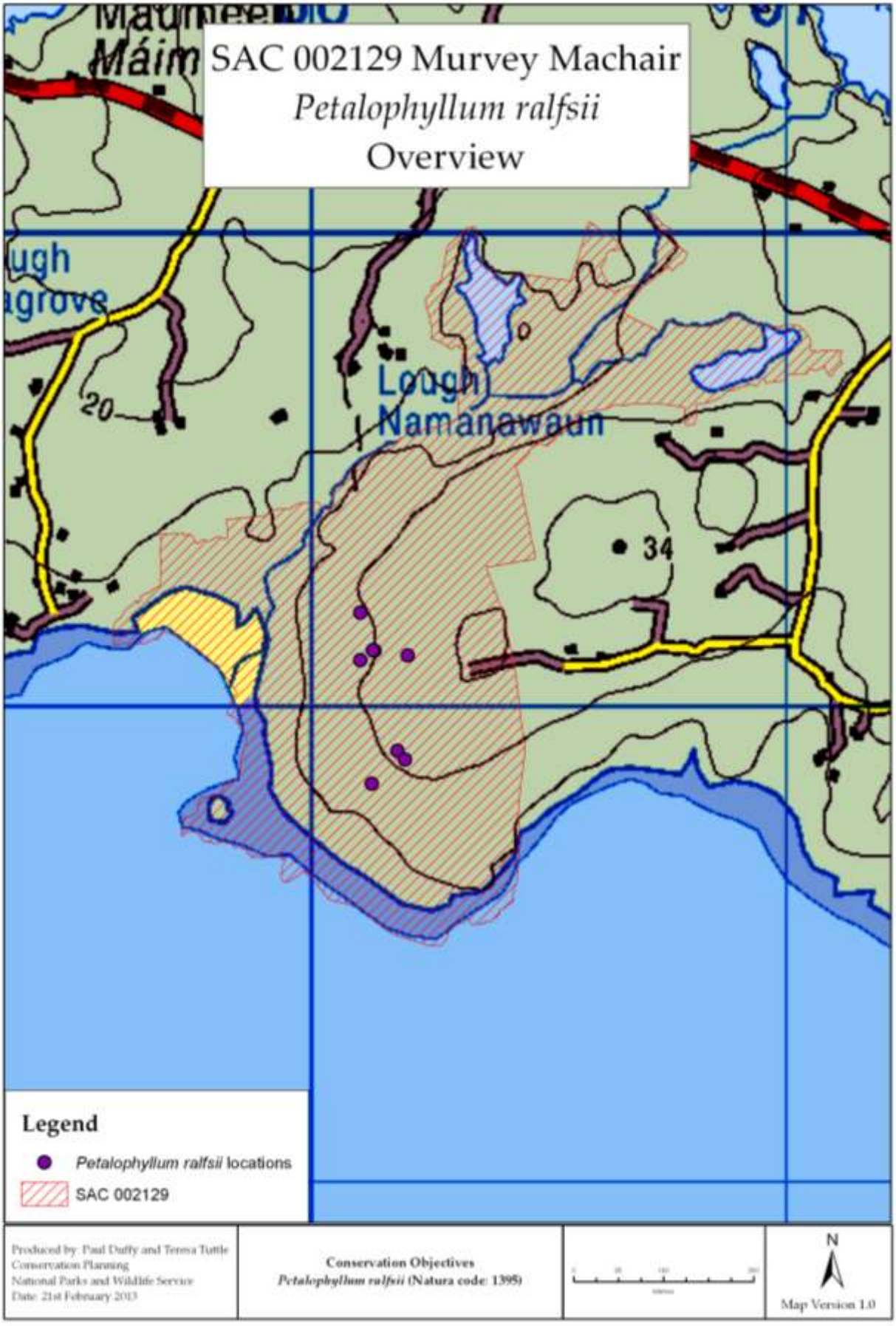
One thallus at L6613/3912 and about 100 thalli at L6620/3911 in partly bare patches of very short (*ca*. 4 cm) moss-rich grassland on unshaded calcareous sand of machair slope. Extensive areas currently appear ideal for *P. ralfsii*, yet it is scarce and local. Whole area currently overgrazed by sheep.

Field notes from Neil Lockhart (1 November 2006):

Overall the machair is in excellent condition for *P. ralfsii*, tightly grazed by sheep and very wet flushes interspersed with granite outcrops and sandy/grassy slopes. Found a population of *P. ralfsii* at L66194/38891, alt. 24 m, approximately where the October 1998 relevé was recorded. Six plants seen. Only one plant seen on the steep flushed slopes where the original June 1998 find occurred.

Associates:

Agrostis stolonifera
Amblyodon dealbatus
Amblystegium serpens var. *salinum*
Anagallis tenella
Bellis perennis
Brachythecium mildeanum
Calliergonella cuspidata
Campylium elodes
Carex flacca
Cephalozia bicuspidata
Cerastium fontanum
Cratoneuron filicinum
Didymodon rigidulus
Distichium inclinatum
Ditrichum gracile
Festuca rubra
Galium verum
Leontodon autumnalis
Lotus corniculatus
Moerckia flotoviana
Pellia endiviifolia
Plantago coronopus
Plantago lanceolata
Prunella vulgaris
Sagina procumbens
Thymus praecox


SAC 002129 Murvey Machair
Petalophyllum ralfsii
Overview
Lough Namanawaun
20
34
Legend
Petalophyllum ralfsii locations
SAC 002129
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 21st February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 002129 Murvey Machair
Petalophyllum ralfsii
Locality 15 Murvey Machair
Legend
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 21st February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Black Head-Poulsallagh Complex SAC (IE000020)

Locality No. 16: Fanore, Co. Clare; Grid ref. M138086

Field notes from Neil Lockhart (24 February 1998):

Twelve plants near a limestone boulder; *ca*. 9 rosettes amongst tight turf near a limestone boulder; another colony of just 3 plants about 2 m away. Plants occur in a low-lying eroded plain, amongst a damp mossy turf strewn with large limestone boulders. Rare moss *Pleurochaete squarrosa* occurs here. Tight turf currently maintained by rabbit-grazing - no perceived threats at present, except nearby amenity use in caravan park.

Field notes from Neil Lockhart (31 October 2006):

Small population found at M13824 08799, 4 m alt, about 8 m east of original population (where it appears to have gone). Habitat very much the same as in 1998 - tight turf over limestone strewn with boulders. Counted 10 plants in a grassy turf (not the open moss turf) on the slightly sloping sides of the lowest part of a kind of track from the dunes to the sea. Plants are very scarce here and hard to find. Habitat appears to be in good condition.

Associates:

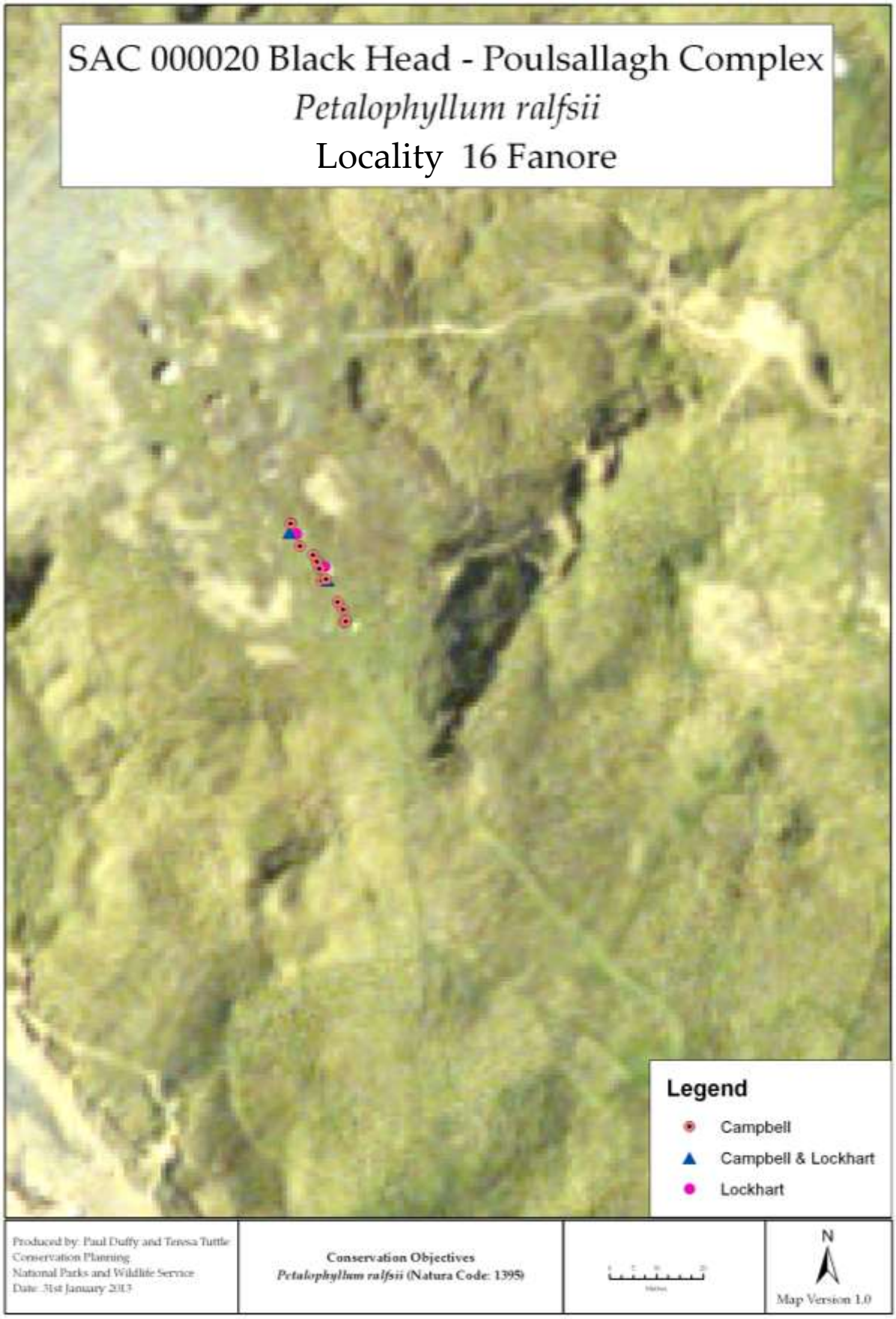
Aneura pinguis
Bellis perennis
Brachythecium mildeanum
Bryum sp.
Carex flacca
Cerastium fontanum
Didymodon vinealis
Ditrichum gracile
Festuca rubra
Hypnum cupressiforme
Leontodon autumnalis
Lotus corniculatus
Plantago coronopus
Plantago lanceolata
Pleurochaete squarrosa
Syntrichia ruraliformis
Thymus praecox
Trichostomum crispulum

Field notes from Christina Campbell (17 April 2009):

In April 2009 a population *circa* 25 m long and 1–1.5 m wide was found along a trampled path in a damp flat depression strewn with large limestone boulders between sand dunes. Three plots (25 x 50 cm) were recorded along the path on tight turf on sandy loam *circa* 7–9 cm overlying sand *ca.* 16 cm deep overlying limestone. Rabbit-grazing was evident and droppings were observed. Details of three 25 x 50 cm plots recorded are below.

Fanore	**Plot 1 (50 x 25 cm)**	**Plot 2 (50 x 25 cm)**	**Plot 3 (50 x 25 cm)**
Distance from sea (m)	168	157	144
Altitude (metres above sea level)	3	3	3
Slope (degrees)	0	5	0
Aspect	-	East	-
Soil depth (cm)	7	7	9
Soil pH	8.1	8.15	8.12
Soil conductivity (μS/cm)	105	104.5	102
Depth to bedrock (cm)	23	26	23
Number of *P. ralfsii* thalli	1	5	3
Mean vegetation height (cm)	1.72	2.14	1.77
Maximum vegetation height (cm)	3	3.5	3
Cover (Domin):			
Total cover	9	10	10
Grass cover	6	5	8
Sedge cover	4	6	6
Forb cover	5	6	6
Bryophyte cover	4	8	8
Algae cover	+	0	0
Litter cover	5	5	6
Bare soil cover	4	4	4
Dung cover	0	2	0
Agrostis stolonifera	2	0	0
Aneura pinguis	2	0	0
Barbula convoluta	2	3	2
Bellis perennis	3	1	0
Brachythecium mildeanum	1	3	4
Bryum algovicum	1	0	4
Bryum pseudotriquetrum	3	4	2
Bryum sp.	0	2	0
Carex flacca	4	6	6
Ctenidium molluscum	0	4	0
Didymodon fallax	0	0	3
Distichium inclinatum	2	4	4
Festuca rubra	6	5	8
Leontodon autumnalis	2	4	2
Lophocolea bidentata	0	0	2
Lotus corniculatus	2	2	0
Orthotrichum diaphanum	0	1	0
Plantago coronopus	2	0	1
Plantago lanceolata	2	4	4
Pleurochaete squarrosa	0	2	0
Ranunculus repens	1	0	2
Thymus praecox	+	4	4
Trifolium repens	2	0	0


SAC 000020 Black Head - Poulsallagh Complex
Petalophyllum ralfsii
Overview
THE BURREN
Boirinn
Legend
Petalophyllum ralfsii locations
SAC 000020
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 31st January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura Code: 1395)
N
Map Version 1.0


SAC 000020 Black Head - Poulsallagh Complex
Petalophyllum ralfsii
Locality 16 Fanore
Legend
Campbell
Campbell & Lockhart
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 31st January 2013
Conservation Objectives
Petalophyllum ralfsii (Natura Code: 1395)
N
Map Version 1.0

Tralee Bay and Magharees Peninsula, West to Cloghane SAC (IE002070)

Locality No. 17a: SW of Lough Naparka, Co. Kerry; Grid ref. Q616168

Field notes from Neil Lockhart (30 January 1998):

Five rosettes at this location. Plants occur on sloping side of low (*ca*. 50 cm) sandy ridge, above *Salix repens* zone, *ca*. 1 m from open water, *ca*. 35 cm above current water table, in a tightly grazed mossy turf with an open sunny aspect. Several of the larger wet slacks east of the road are heavily used as winterage for cattle. Over-stocking has made many of these potential sites unsuitable for *P. ralfsii*. Reduction in stock numbers recommended.

Field notes from Nick Hodgetts (20 May 2003):

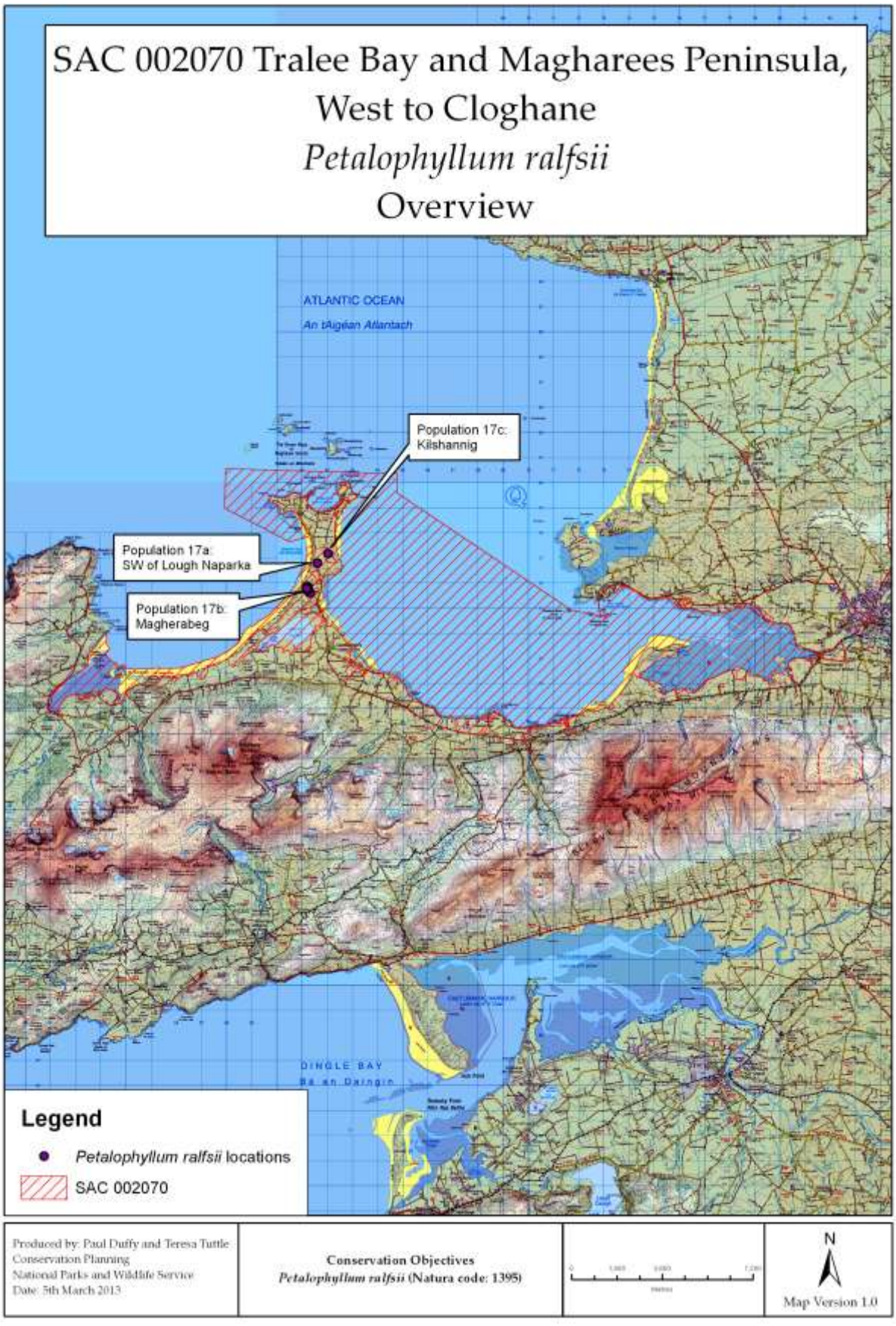
Small heavily poached slack surrounded by dunes, with limited bryological interest. *P. ralfsii* not refound. Some possibly suitable habitat remaining, but becoming encroached upon by vascular plant vegetation.

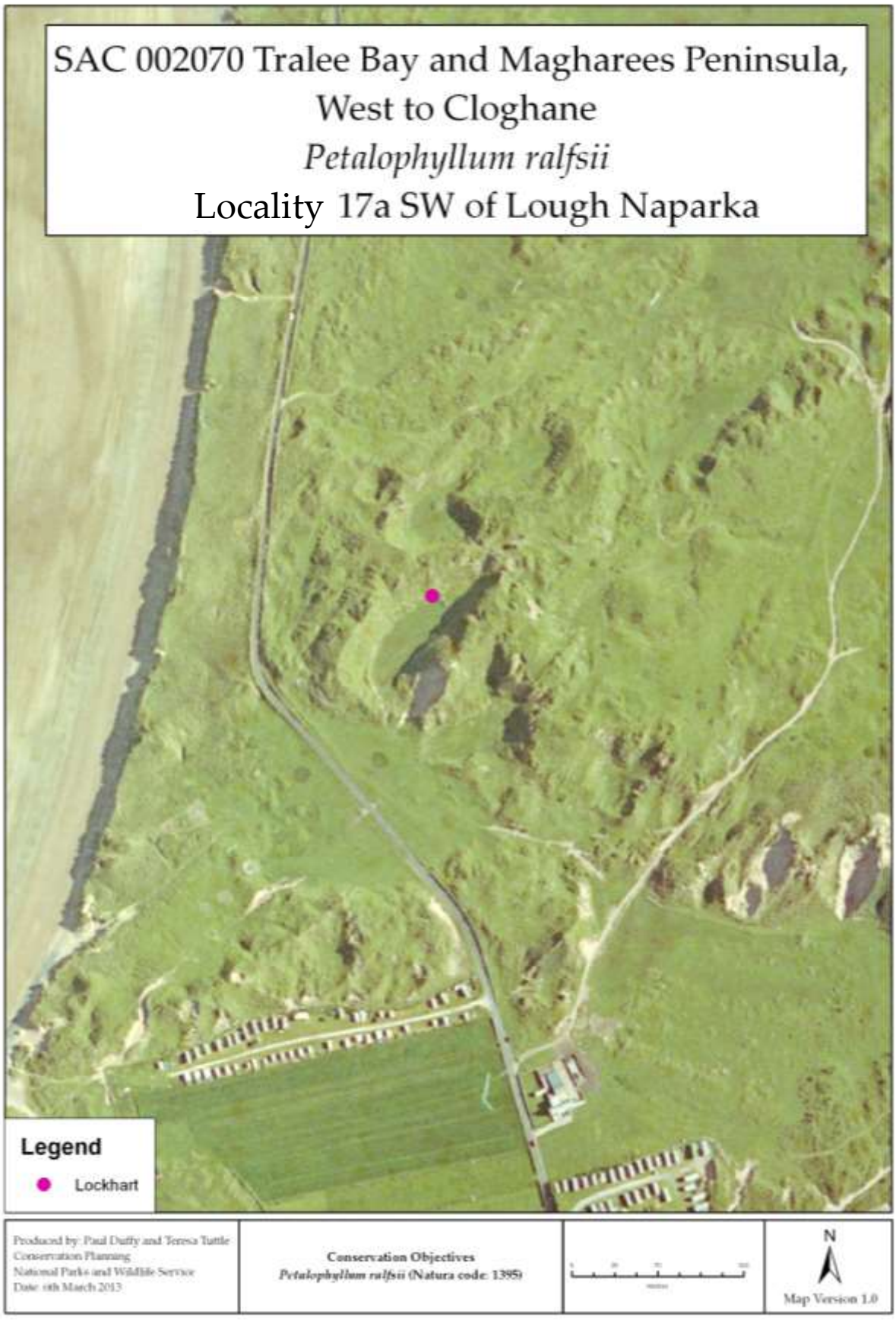
Field notes from Neil Lockhart (21 November 2006):

Re-visit to search for NL's 1998 record of *P. ralfsii*. Almost no open water in the slack, despite recent heavy rains – so the area where *P. ralfsii* occurred is too dry and no longer suitable. The lower areas of the slack are too enriched, with *Calliergonella cuspidata*, so don't look suitable either.

Associates:

Amblystegium serpens var. *salinum*
Bellis perennis
Brachythecium rutabulum
Bryoerythrophyllum recurvirostrum
Bryum pseudotriquetrum
Calliergonella cuspidata
Carex flacca
Festuca rubra
Homalothecium lutescens
Lotus corniculatus
Luzula campestris
Nostoc sp.
Pilosella officinarum
Plagiomnium affine
Plantago lanceolata
Poa pratensis
Prunella vulgaris
Pseudoscleropodium purum
Ranunculus bulbosus
Senecio jacobaea
Trifolium repens


SAC 002070 Tralee Bay and Magharees Peninsula, West to Cloghane
Petalophyllum ralfsii
Overview
ATLANTIC OCEAN
An tAigéan Atlantach
Population 17c: Kilshannig
Population 17a: SW of Lough Naparka
Population 17b: Magherabeg
DINGLE BAY
Bá an Daingin
Legend
Petalophyllum ralfsii locations
SAC 002070
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 5th March 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 002070 Tralee Bay and Magharees Peninsula, West to Cloghane
Petalophyllum ralfsii
Locality 17a SW of Lough Naparka
Legend
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 6th March 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Tralee Bay and Magharees Peninsula, West to Cloghane SAC (IE002070)

Locality No. 17b: Magherabeg, Co. Kerry; Grid ref. Q612158

Field notes from Neil Lockhart (28 January 1998):

P. ralfsii appears to be confined to the north-eastern margin of the largest flat depression, at the base of the highest dune ridge. *Scorpidium revolvens* and *Campylium* spp. in the wettest parts here indicate calcareous ground water. Sparsely present (3–4 rosettes) on each of four sandy hillocks examined. Probably also occurs on the many other low hillocks extending south-east from here along the shoreline of the winter-flooded trench. Scattered rosettes occur on low (*ca*. 1 m) compacted sandy hillocks around the NE edge of flat, flooded depression. Plants occur halfway up amongst low, tightly grazed turf. Principal threat is from agricultural eutrophication. Cattle are overwintered on the commonage, and the flooded depressions further south appeared more enriched and less suitable for calcareous bryophytes.

Field notes from Nick Hodgetts (20 May 2003):

36 thalli seen in roughly the same place as in 1998, on small hummocks in large dune slack with sand/humus soil, scattered over *ca*. 50 m length. Also several small groups of thalli along a *ca*. 20 m length at the base of dunes at the northern end of the slack. There is a discontinuous strip of bare ground with scattered *P. ralfsii* above the slack but below the dry dunes, just above the *Salix repens* zone.

Field notes from Neil Lockhart (21 November 2006):

Not refound in 2006, when site was very dry.

Associates:

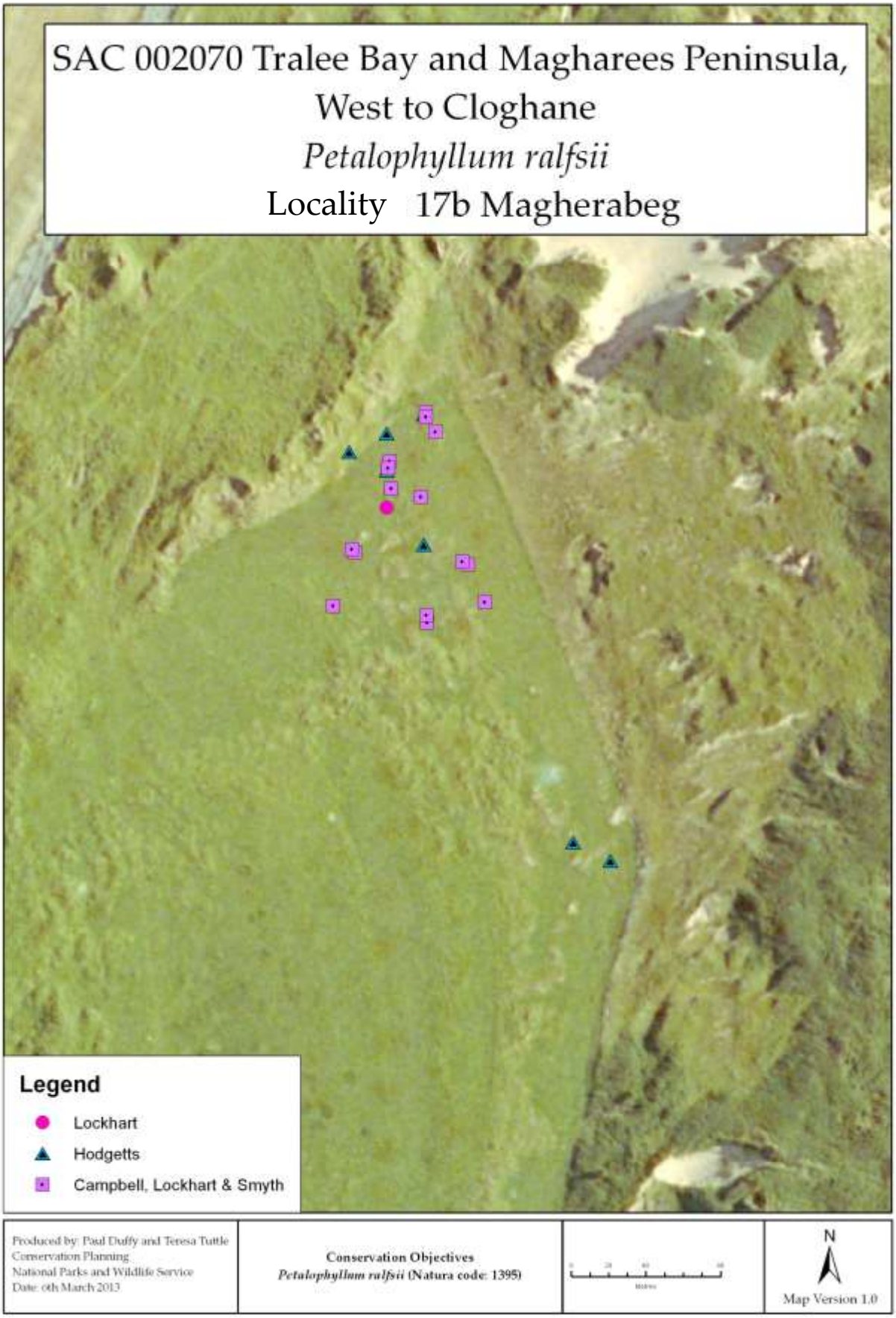
Amblystegium serpens var. *salinum*
Aneura pinguis
Barbula convoluta
Bellis perennis
Brachythecium glareosum
Bryoerythrophyllum recurvirostrum
Bryum pallens
Campylium stellatum
Carex arenaria
Carex flacca
Cephalozia sp.
Cratoneuron filicinum
Didymodon fallax
Eucladium verticillatum
Euphrasia sp.
Festuca rubra
Fissidens taxifolius
Galium verum
Hieracium sp.
Homalothecium lutescens
Hypnum lacunosum
Leontodon autumnalis
Lophocolea bidentata
Lotus corniculatus
Plantago lanceolata
Polygala vulgaris
Prunella vulgaris
Pseudoscleropodium purum
Ranunculus bulbosus
Riccardia multifida
Sagina procumbens
Salix repens
Scorpidium revolvens
Thymus praecox
Tortella flavovirens
Trichostomum brachydontium

Field notes from Christina Campbell, Neil Lockhart & Noeleen Smyth (2 & 4 March 2009):

Colonies occurred on disturbed hillocks and eroded sand mounds in a dune slack with a dune ridge to the north-east. There was open standing water in some parts of the site. Five plots (25 x 50 cm) were recorded on such hummocks with *Salix repens*. Plot 4 contained many fen species. The site is grazed by cattle and a winter-feeder was seen nearby. The ground between the hummocks was severely torn-up with vehicle tracks from possibly quad-bike scrambling which were extensive at the site when visited in March 2009. *Hippophae rhamnoides* was also prevalent in parts of the nearby dune. Encroachment of this invasive shrub is a possible threat, as is the expansion of a neighbouring golf course. Details of five 25 x 50 cm plots recorded are below.

Magherabeg	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Distance from sea (m)	297	287	351	347	288
Altitude (metres above sea level)	3.29	2.18	5.89	2.8	2.12
Slope (degrees)	10	15	5	10	5
Aspect	East	East	West	West	South
Soil depth (cm)	1.5	3	20	2	3
Soil pH	7.74	7.82	7.88	7.79	7.83
Depth to groundwater (cm)	30	32	20	24	18.5
Groundwater pH	7.22	6.97	7.12	7.22	7.27
Groundwater conductivity (μS/cm)	650	846	678	593	596
Number of thalli	8	1	2	1	2
Mean vegetation height (cm)	2.0	4.2	2.8	2.3	2.1
Maximum vegetation height (cm)	4	12	4	4	5
Cover (Domin):					
Total cover	9	9	9	9	9
Shrub cover	2	4	1	1	0
Rush cover	0	+	0	0	0
Grass cover	5	6	8	8	8
Sedge cover	5	4	4	1	2
Forb cover	5	5	4	5	5
Bryophyte cover	8	6	6	5	7
Algae cover	0	0	0	2	+
Litter cover	5	5	5	7	5
Bare soil cover	4	4	4	4	4
Dung cover	0	3	+	1	3
Agrostis stolonifera	1	0	+	2	2
Amblystegium serpens var. *salinum*	2	2	0	3	0
Barbula convuluta	+	4	2	0	1
Bellis perennis	2	2	3	4	4
Brachythecium mildeanum	1	2	1	1	4
Bryum pseudotriquetrum	0	0	0	1	0
Bryum sp.	4	1	0	0	0
Calliergonella cuspidata	0	0	1	0	0
Carex arenaria	0	0	0	0	1
Carex flacca	4	4	4	2	2
Cerastium fontanum	0	3	0	+	2
Didymodon fallax	2	1	2	0	0
Festuca rubra	5	5	8	7	7
Fissidens adianthoides	0	0	0	2	0
Galium aparine	0	0	+	0	0
Juncus articulatus	0	+	0	0	0
Leiocolea turbinata	5	0	0	0	0
Leontodon autumnalis	4	1	+	0	2
Lophocolea bidentata	1	1	2	1	1

Magherabeg (continued)	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Lotus corniculatus	0	3	2	0	2
Luzula multiflora	2	3	+	5	4
Nostoc sp.	0	0	0	2	+
Plantago coronopus	0	0	1	0	0
Plantago lanceolata	2	0	+	4	1
Prunella vulgaris	4	1	+	4	+
Pseudoscleropodium purum	5	4	2	5	2
Ranunculus repens	0	0	+	1	+
Sagina nodosa	+	0	0	0	3
Salix repens	0	4	1	1	0
Senecio jacobaea	0	0	+	2	0
Thuidium tamariscinum	0	0	+	0	0
Thymus praecox	3	3	0	4	2
Syntrichia ruralis var. *ruraliformis*	0	0	0	0	2
Trifolium repens	0	1	0	+	2


SAC 002070 Tralee Bay and Magharees Peninsula, West to Cloghane
Petalophyllum ralfsii
Locality 17b Magherabeg
Legend
Lockhart
Hodgetts
Campbell, Lockhart & Smyth
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 6th March 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Tralee Bay and Magharees Peninsula, West to Cloghane SAC (IE002070)

Locality 17c: Kilshannig, Co. Kerry; Grid ref. Q620172

Field notes from Nick Hodgetts (21 May 2003):

Three thalli found at edge of slack in sand/humus soil, just above cattle track and zone of creeping willow.

Associates:

Aneura pinguis
Bellis perennis
Bryum pseudotriquetrum
Carex flacca
Cratoneuron filicinum
Festuca rubra
Hieracium sp.
Hypnum lacunosum
Lotus corniculatus
Moerckia flotoviana
Prunella vulgaris
Trifolium spp.


SAC 002070 Tralee Bay and Magharees Peninsula, West to Cloghane
Petalophyllum ralfsii
Locality 17c Kilshannig
Legend
Hodgetts
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 6th March 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Castlemaine Harbour SAC (IE000343)

Locality No. 18a: Inch Spit, Co. Kerry; Grid ref. V67_97_

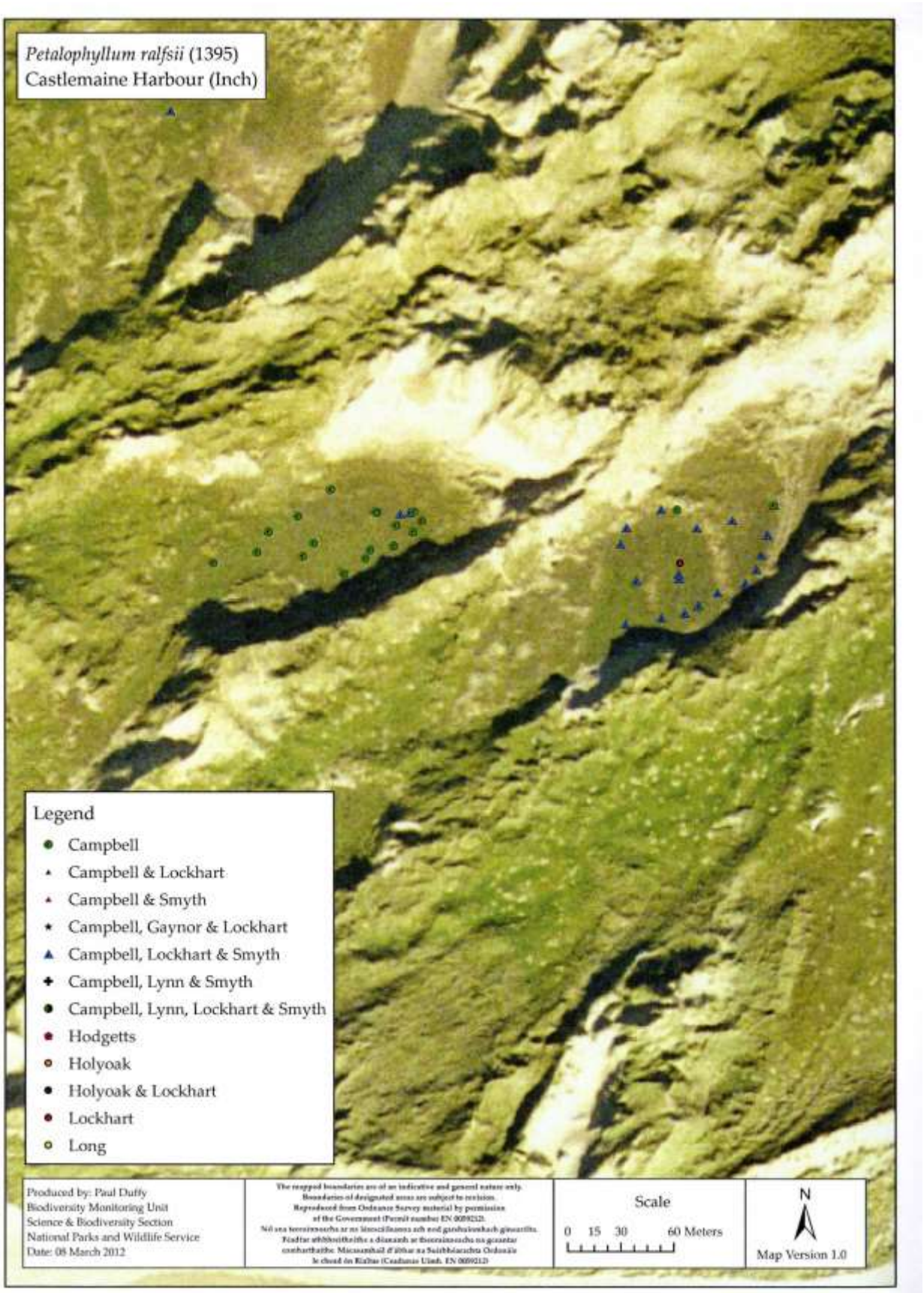
P. ralfsii was recorded as 'common' at the south tip of the spit in 1983 by N. Lockhart, but no further information was available.

Field notes from Christina Campbell, Neil Lockhart & Noeleen Smyth (4 March 2009 & 5 May 2010):

P. ralfsii was found in three slacks in March 2009. The extent of occupancy was mapped at the first two (nearest to the tip of the spit), but only one thallus was found in the third slack at 2009 and subsequent searches in 2010 & 2011 were unsuccessful. Three plots (25 x 50 cm) were recorded in the first slack and one plot (25 x 50 cm) was recorded in the second. Open surface water pools were present in lower parts of the slacks. The site is grazed by cattle and sheep. There is an on-going proposal to build a golf-course on the spit which could potentially impinge directly upon the populations at Inch or indirectly through change in the hydrology of the site. There was evidence of quad-biking on some dunes, although not in the slacks surveyed. Details of four 25 x 50 cm plots recorded are below.

Inch	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**
Year	2009	2009	2009	2010
Distance from sea (m)	446	444	410	437
Altitude (metres above sea level)	0.19	0.69	0.30	0.20
Slope (degrees)	0	0	0	0
Aspect	-	-	-	-
Soil depth (cm)	12	0	3	44
Soil pH	7.67	7.84	7.42	8.13
Depth to groundwater (cm)	19	20	19	56.5
Groundwater pH	7.04	7.29	6.81	7.17
Groundwater conductivity (μS/cm)	529	418	635	707
Number of *P. ralfsii* thalli	8	8	7	9
Mean vegetation height (cm)	6.0	4.4	3.3	2.2
Maximum vegetation height (cm)	8	5	7	7.5
Cover (Domin)				
Total	10	7	9	9
Shrub	4	4	1	4
Grass	5	4	6	4
Sedge	3	3	4	4
Forb	5	1	4	4
Bryophyte	8	4	8	9
Algae	+	1	1	0
Litter	4	4	4	5
Bare soil	3	8	4	3
Dung	0	0	0	1
Agrostis stolonifera	5	2	5	0
Aneura pinguis	2	1	2	0
Bellis perennis	0	0	0	1
Brachythecium mildeanum	0	1	1	0
Bryum pseudotriquetrum	0	1	0	7
Bryum sp.	5	1	2	6
Calliergonella cuspidata	0	0	4	0
Carex arenaria	1	0	0	0

Inch (continued)	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**
Carex flacca	2	3	4	4
Carex nigra	0	0	2	1
Didymodon fallax	4	2	4	7
Festuca rubra	3	4	1	4
Leontodon autumnalis	4	0	4	4
Lotus corniculatus	0	0	2	0
Nostoc sp.	+	1	1	0
Plantago lanceolata	0	0	0	2
Pohlia wahlenbergii	6	4	4	0
Prunella vulgaris	5	0	2	3
Rhytidiadelphus triquetrus	1	0	0	0
Sagina procumbens	0	+	2	0
Salix repens	0	0	0	4
Syntrichia ruralis var. *ruraliformis*	0	0	0	4


Petalophyllum ralfsii (1395)
Castlemaine Harbour (Inch)
Legend
Campbell
Campbell & Lockhart
Campbell & Smyth
Campbell, Gaynor & Lockhart
Campbell, Lockhart & Smyth
Campbell, Lynn & Smyth
Campbell, Lynn, Lockhart & Smyth
Hodgetts
Holyoak
Holyoak & Lockhart
Lockhart
Long
Produced by: Paul Duffy
Biodiversity Monitoring Unit
Science & Biodiversity Section
National Parks and Wildlife Service
Date: 08 March 2012
Scale
0 15 30 60 Meters
N
Map Version 1.0

Castlemaine Harbour SAC (IE000343)

Locality No. 18b: Rosbehy; Grid ref. V64759163

Field notes from Neil Lockhart (29 July 1998):

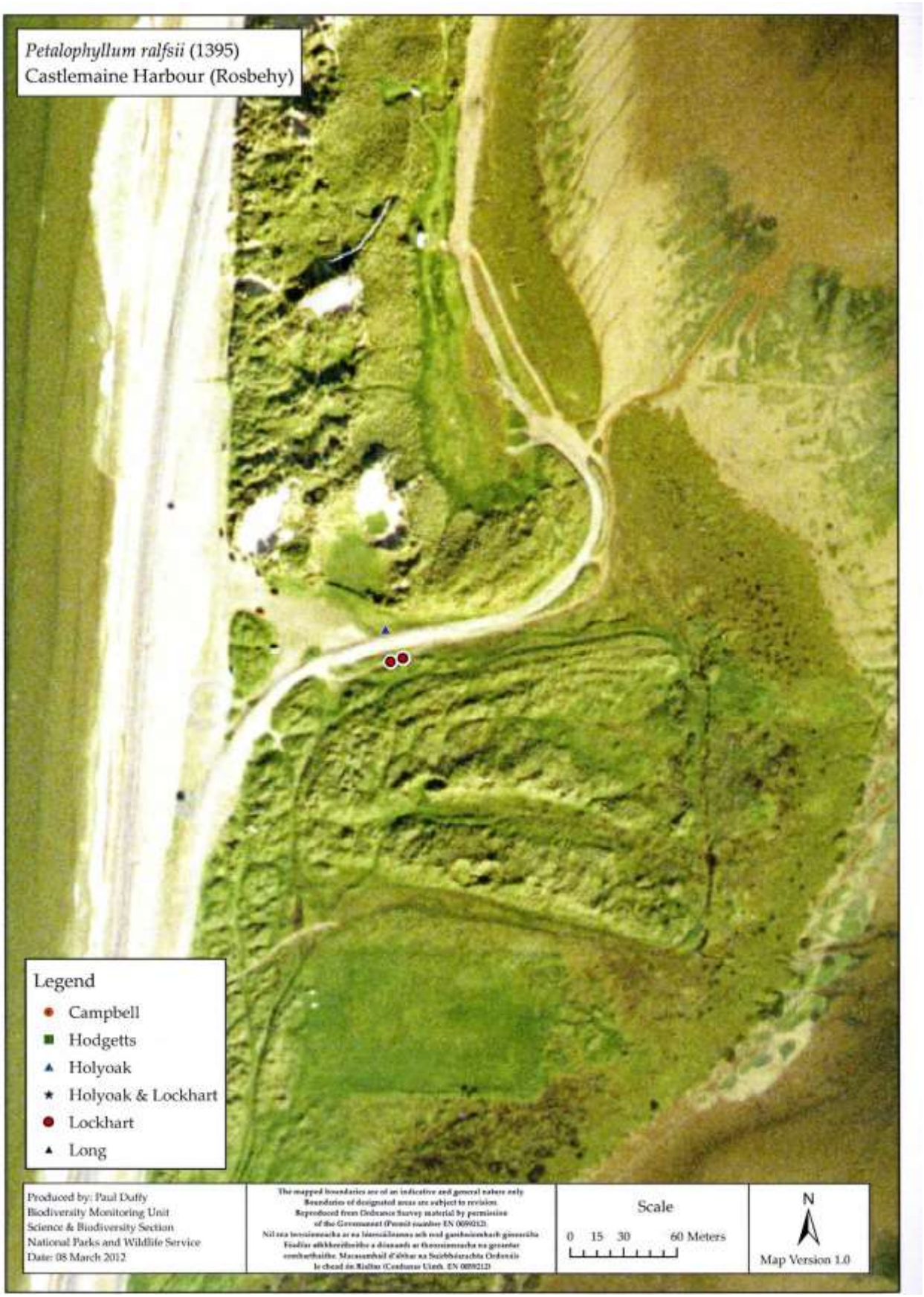
Little suitable habitat, as the spit is relatively narrow and mostly comprises *Ammophila* dunes. Some flooded depressions do occur on the eastern side, about ⅔ the way up the spit. Some suitable low sandy knolls were found but are possibly not calcareous enough - no calcicole indicators were seen. The pools themselves had *Calliergonella cuspidata* and *Homalothecium lutescens*.

Field notes from David Holyoak (22 May 2006):

20 small thalli of *P. ralfsii* were seen on damp, partly bare, compressed humic sand of dune slack/track edge; *ca*. 5 m alt. at the grid reference given above.

Field notes from Neil Lockhart (12 October 2012):

Still at 64760 91614 alt. 3 m, 3 thalli. Another 4 at 64753 91612 (in a 1 m^2). Area of suitable niche is 40 m x 1 m.


Petalophyllum ralfsii (1395)
Castlemaine Harbour (Rosbehy)
Legend
Campbell
Hodgetts
Holyoak
Holyoak & Lockhart
Lockhart
Long
Produced by: Paul Duffy
Biodiversity Monitoring Unit
Science & Biodiversity Section
National Parks and Wildlife Service
Date: 08 March 2012
The mapped boundaries are of an indicative and general nature only.
Boundaries of designated areas are subject to revision.
Reproduced from Ordnance Survey material by permission
of the Government (Permit number EN 0059212).
Scale
0 15 30 60 Meters
N
Map Version 1.0

Ballinskelligs Bay and Inny Estuary SAC (IE000335)

Locality 19: West of Inny Ferry, Co. Kerry; Grid ref. V474682

Field notes from Neil Lockhart (25 January 1998):

This is very likely Scully's 1890 station for *P. ralfsii*, "about 1 mile west of the ferry on the north side". Two populations were found on a sandy bank/ridge bordering the south-east side of the eastern reedbed. These appear to be the only plants on the western side of the Inny, as the sand flats further to the west are semi-improved and heavily used by cattle and did not appear suitable. One population consisted of a single rosette, the other of *ca.* 30–50 rosettes over an area of *ca.* 1 x 2 m. Plants growing in tightly-grazed turf, firm but moist sandy soil, on sandy ridge (*ca.* 1 m tall), half way up, surrounding flooded depression. This site is heavily grazed and poached by cattle and is most threatened by agricultural improvement/reclamation. The sand ridge is being eroded and is vulnerable to re-grading should the reedbed behind be drained.

Field notes from Neil Lockhart (1 March 2007):

Re-visit by NL to search for 1998 record of *P. ralfsii*. Not found after about 1 hour search. The habitat appears to be much the same as described in 1998, still grazed by cattle and much poached - vegetation quite rank and there's not much suitable compact mossy turf available. The plant was scarce even in 1998, so it may well still be present but not seen on this visit. The threat of agricultural intensification or reclamation remains. In the localities where seen before there appear to be some blow outs or scrapes of bare sand, which in time might be worth looking at.

Associates:

Agrostris stolonifera
Aneura pinguis
Bellis perennis
Brachythecium albicans
Brachythecium rutabulum
Bryum pseudotriquetrum
Carex arenaria
Carex flacca
Cerastium fontanum
Festuca rubra
Leontodon cf. *autumnalis*
Lophocolea bidentata
Lotus corniculatus
Luzula campestris
Pedicularis cf. *palustris*
Plagiomnium undulatum
Plantago lanceolata
Prunella vulgaris
Pseudoscleropodium purum
Rhytidiadelphus squarrosus
Riccardia multifida
Sagina procumbens
Trifolium repens

Field notes from Christina Campbell & Noeleen Smyth (June 2009, May 2010, November 2010 and February 2011):

This location was visited in June 2009, May 2010, November 2010 and February 2011 but no thalli were recorded in this, or any surrounding area, despite extensive searches. The site appeared to be under-grazed, although some evidence of cattle-grazing was present. The sward appeared even less open in February 2011 than it did in June 2009.


SAC 000335 Ballinskelligs Bay and Inny Estuary
Petalophyllum ralfsii
Overview
Bá na Scealg
Ballinskelligs Bay
Ceann Muice
Hog's Head
Farranlaragh Mountain
Legend
Petalophyllum ralfsii locations
SAC 000335
Produced by: Paul Duffy and Teresa Tuffie
Conservation Planning
National Parks and Wildlife Service
Date: 14th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 000335 Ballinskelligs Bay and Inny Estuary
Petalophyllum ralfsii
Locality 19 West of Inny Ferry
Legend
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 14th February 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

North Dublin Bay SAC (IE000206)

Locality No. 20: North Bull, Co. Dublin; Grid ref. O247378 etc.

Field notes from Neil Lockhart (16 June 1999):

More than 100 thalli along the track for *ca.* 80 m. The only known east coast locality in Ireland. Probably the same site as recorded by Pitkin and Synnott in 1975.

Field notes from David Holyoak (17 November 2004):

Five thalli on trampled path through damp hollow in dunes.

Associates:

Aneura pinguis
Anthoxanthum odoratum
Barbula cf. *convoluta*
Brachythecium sp.
Carex flacca
Cirsium palustre
Cratoneuron filicinum
Didymodon tophaceus
Festuca rubra
Glaux maritima
Holcus lanatus
Juncus articulatus
Leontodon autumnalis
Plantago coronopus
Plantago lanceolata
Poa annua
Polygala serpyllifolia
Prunella vulgaris
Ranunculus bulbosus
Trifolium pratense
Trifolium repens

Field notes from Christina Campbell, Neil Lockhart & Noeleen Smyth (11 & 13 February 2009):

The population occurs on a track *circa* 1 m wide (to 2 m in places) along the seaward side of the Alder Marsh, a dune slack on the north end of the island, in the fixed dune. The population here is maintained by trampling and rabbit-grazing which keep the soil compact and the vegetation low. Five plots were recorded here at various points along the track. Open standing water was observed at the site in March 2009. Details of five plots recorded are below.

North Bull	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Distance from sea (m)	119	117	153	167	169
Altitude (metres above sea level)	3	3	3.5	5	5
Slope (degrees)	0	0	0	0	0
Aspect	-	-	-	-	-
Soil depth (cm)	9	9	11	9	9
Soil pH	7.54	7.49	7.70	7.86	7.65
Depth to groundwater (cm)	19	18	19	15.5	15.5
Groundwater pH	7.14	7.18	6.91	7.04	6.98
Groundwater conductivity (µS/cm)	718	606	976	715	944
Number of thalli	1	2	3	2	1
Mean vegetation height (cm)	5	5	3	5	3
Maximum vegetation height (cm)	6	7.5	4	6	4
Cover (Domin):					
Total cover	9	9	9	9	9
Grass cover	4	6	4	5	5
Sedge cover	8	5	6	8	8
Forb cover	4	4	2	3	3
Bryophyte cover	7	7	1	6	4
Litter cover	5	5	5	5	5
Bare soil cover	6	4	6	4	5
Agrostis stolonifera	4	1	1	4	4
Amblystegium serpens var. *salinum*	1	1	0	5	5
Aneura pinguis	5	4	1	4	4
Anthoxanthum odoratum	3	1	1	1	1
Brachythecium mildeanum	0	1	0	0	0
Carex arenaria	1	0	0	0	0
Carex flacca	8	5	7	8	8
Ctenidium molluscum	2	4	0	5	5
Equisetum variegatum	0	0	0	+	0
Festuca rubra	4	5	3	5	4
Leontodon autumnalis	2	2	0	1	1
Prunella vulgaris	2	2	1	4	1
Ranunculus repens	0	0	0	+	0
Trifolium repens	1	1	0	2	2


SAC 000206 North Dublin Bay
Petalophyllum ralfsii
Overview
Sutton
Cill Fhionntain
Kilbarrack
Cill Bharrad
Raheny
Rath Lanaigh
Sutton Strand
Island
Bhulla
Bull
an
North
Oileán
Bull Wall
DUBLIN HARBOUR
Breakwater
North Bull Lighthouse
North Bank Lighthouse
Poolbeg Lighthouse
Dollymount
Clontarf
Grange
Legend
Petalophyllum ralfsii locations
SAC 000206
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 5th March 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0


SAC 000206 North Dublin Bay
Petalophyllum ralfsii
Locality 20 North Bull
Legend
Campbell & Smyth
Campbell, Lockhart & Smyth
Holyoak
Lockhart
Produced by: Paul Duffy and Teresa Tuttle
Conservation Planning
National Parks and Wildlife Service
Date: 5th March 2013
Conservation Objectives
Petalophyllum ralfsii (Natura code: 1395)
N
Map Version 1.0

Barley Cove to Ballyrisode Point SAC (IE001040)

Locality No. 21: Barley Cove, Co. Cork; Grid ref. V7706025950 etc.

Field notes from Neil Lockhart (13 October 2012):

Two *P. ralfsii* thalli at V77060 25950, alt. 4 m in compact tightly grazed (sheep) turf on ridge of trackway - area of suitable niche 75 m x 1 m all along track. 3 thalli at V76991 25984, alt. 4 m. Also in and around a dune slack at V76903 25832, alt. 6 m – about 8 thalli/m^2 – area of suitable niche *ca*. 1 m wide in a zone around parts of slack *ca*. 40 m. Also at V76905 25834.

Associates:

Bellis perennis
Carex flacca
Didymodon sp.
Nostoc sp.
Plantago coronopus


Petalophyllum ralfsii (1395)
Barley Cove to Ballyrisode Point
Legend
Campbell
Hodgetts
Holyoak
Holyoak & Lockhart
Lockhart
Long
Produced by: Paul Duffy
Biodiversity Monitoring Unit
Science & Biodiversity Section
National Parks and Wildlife Service
Date: 08 March 2012
Scale
0 15 30 60 Meters
N
Map Version 1.0

Appendix III – GPS points and associated data for maps

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
1	Rosses Strand (Tranarossan and Melmore Lough)	211860	442820	C14	C1142	25/05/2002	2002	Holyoak	GPS	
1	Rosses Strand	211860	442800	C14	C1142	08/05/2006	2006	Lockhart	GPS	
1	Rosses Strand	211853.34	442804.56	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211855.95	442803.47	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211859.13	442802.1	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211855.9	442805.57	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211854.68	442806.18	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211917.63	442806.55	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211917.93	442808.7	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211919.43	442806.08	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
1	Rosses Strand	211855.09	442804.78	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 1 (T1)
1	Rosses Strand	211918.5	442803.93	C14	C1142	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 2 (T2)
1	Rosses Strand	211856.27	442804.94	C14	C1142	08/04/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
2	Rosepenna (Sheephaven)	212069	437224	C13	C1237	05/08/1999	1999	Holyoak	From Map/Ortho	Derived from sketch map
2	Rosepenna	212038	437192	C13	C1237	05/08/1999	1999	Holyoak	From Map/Ortho	Derived from sketch map
2	Rosepenna	212007.15	437391.76	C13	C1237	01/04/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 1 (R1)
3	Tramore (Horn Head & Rinclevan)	198240	436010	B93	B9836	02/06/2002	2002	Holyoak	GPS	
4a	Damph Beg (Gweedore Bay and Islands)	180230	429550	B82	B8029	27/04/2002	2002	Holyoak	GPS	
4a	Damph Beg	180198	429474	B82	B8029	04/08/1999	1999	Holyoak	From Map/Ortho	Derived from sketch map
4b	Derrybeg (Gweedore Bay and Islands)	179870	426190	B72	B7926	28/04/2002	2002	Holyoak	GPS	
4b	Derrybeg	179865	426198	B72	B7926	08/05/2006	2006	Lockhart	GPS	
4c	Keadew Point (Gweedore Bay and Islands)	173090	418140	B71	B7318	25/04/2002	2002	Holyoak	GPS	
4c	Keadew Point	173293	418100	B71	B7318	09/02/1998	1998	Lockhart	From Map/Ortho	Derived from sketch map
4c	Keadew Point	173293	418100	B71	B7318	09/05/2006	2006	Lockhart	GPS	Relocated Lockhart 1998 record
4c	Keadew Point	173089	418141	B71	B7318	09/05/2006	2006	Lockhart	GPS	Relocated Holyoak record
4c	Keadew Point	173292.66	418095.58	B71	B7318	02/04/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 1 (KP1)
4c	Keadew Point	173087.02	418033.41	B71	B7318	07/04/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*; Plot 2 (KP2)
4c	Keadew Point	173088.61	418030.64	B71	B7318	02/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
4c	Keadew Point	173087.43	418032.72	B71	B7318	02/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
4c	Keadew Point	173085.58	418035.38	B71	B7318	02/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
4c	Keadew Point	173080.64	418044.46	B71	B7318	02/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
4c	Keadew Point	173077.37	418045.13	B71	B7318	02/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
4c	Keadew Point	173082.39	418037.62	B71	B7318	02/04/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
5a	Dooey Point (West of Ardara/Maas Road)	175830	402360	B70	B7502	24/04/2002	2002	Holyoak	GPS	Derived from sketch map
5a	Dooey Point	175888	402216	B70	B7502	03/08/1999	1999	Holyoak	From Map/Ortho	Derived from sketch map

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
5b	Sheskinmore (West of Ardara Maas Road)	168980	395452	G69	G6895	11/02/1998	1998	Lockhart	From Map/Ortho	Same location as Campbell 2009 GPS records
5b	Sheskinmore	168980	395454	G69	G6895	09/05/2006	2006	Lockhart	GPS	Same location as Campbell 2009 GPS records
5b	Sheskinmore	168980.53	395451.32	G69	G6895	31/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 1 (S1)
5b	Sheskinmore	168980.27	395451.5	G69	G6895	31/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
5b	Sheskinmore	168976.32	395450.82	G69	G6895	31/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 2 (S2)
5b	Sheskinmore	168984.16	395450.44	G69	G6895	07/04/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
5b	Sheskinmore	168983.08	395453.05	G69	G6895	07/04/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
5b	Sheskinmore	168980.93	395453.08	G69	G6895	07/04/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
5b	Sheskinmore	168982.45	395451.79	G69	G6895	31/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
5b	Sheskinmore	168980.59	395451.92	G69	G6895	31/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
5b	Sheskinmore	168976.83	395451.76	G69	G6895	31/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
5b	Sheskinmore	168973.85	395450.69	G69	G6895	31/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
6	Bunduff (Bunduff Lough and Machair/ Trawalua / Mullaghmore)	170741	356198	G75	G7056	11/03/1998	1998	Lockhart	From Map/Ortho	Derived from sketch map
6	Bunduff	170718	356247	G75	G7056	31/07/1999	1999	Holyoak	From Map/Ortho	Same location as Campbell 2009 GPS records
6	Bunduff	170720	356280	G75	G7056	27/06/2003	2003	Hodgetts	GPS	
6	Bunduff	170724.23	356231.35	G75	G7056	30/03/2009	2009	Campbell	GPS	Extent of cover
6	Bunduff	170722.41	356235.2	G75	G7056	30/03/2009	2009	Campbell	GPS	Extent of cover
6	Bunduff	170719.13	356240.48	G75	G7056	30/03/2009	2009	Campbell	GPS	Extent of cover
6	Bunduff	170713.1	356246.73	G75	G7056	30/03/2009	2009	Campbell	GPS	Extent of cover
6	Bunduff	170718.16	356250.42	G75	G7056	30/03/2009	2009	Campbell	GPS	Extent of cover
6	Bunduff	170719.01	356253.94	G75	G7056	30/03/2009	2009	Campbell	GPS	Extent of cover
6	Bunduff	170719.68	356253.3	G75	G7056	30/03/2009	2009	Campbell	GPS	Extent of cover
6	Bunduff	170722.16	356232.54	G75	G7056	30/03/2009	2009	Campbell	GPS	*P. ralfsii*; Plot 1 (B1)
6	Bunduff	170719.21	356245.46	G75	G7056	15/03/2010	2009	Campbell	GPS	*P. ralfsii*; Plot 2 (B2)
6	Bunduff	170719.83	356252.51	G75	G7056	11/03/2011	2011	Campbell, Lynn & Smyth	GPS	*P. ralfsii*; Plot 3 (B3)
6	Bunduff	170719.02	356247.41	G75	G7056	15/03/2010	2010	Campbell	GPS	*P. ralfsii*
6	Bunduff	170719.34	356247.78	G75	G7056	15/03/2010	2010	Campbell	GPS	*P. ralfsii*
6	Bunduff	170721.37	356237.47	G75	G7056	15/03/2010	2010	Campbell	GPS	*P. ralfsii*
7	Garter Hill (Glenamoy Bog Complex)	80613	340901	F84	F8040	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	80588	340861	F84	F8040	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	80606	340746	F84	F8040	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	80756	340748	F84	F8040	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	80867	340716	F84	F8040	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	81045	340619	F84	F8140	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	81499	340561	F84	F8140	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	82199	339951	F83	F8239	07/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos
7	Garter Hill	80715	340915	F84	F8040	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_a - derived from sketch map
7	Garter Hill	81809	339965	F83	F8139	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_b - derived from sketch map
7	Garter Hill	81856	340369	F84	F8140	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_c - derived from sketch map
7	Garter Hill	82024	340244	F84	F8240	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_d - Relevé 1 - derived from sketch map
7	Garter Hill	82155	340156	F84	F8240	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_e - derived from sketch map

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1 km Grid Sq.	Date	Year	Source	Accuracy	Notes
7	Garter Hill (Glenamoy Bog Complex)	82347	340450	F84	F8240	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_f - derived from sketch map
7	Garter Hill	82935	340528	F84	F8240	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_g - derived from sketch map
7	Garter Hill	83361	340874	F84	F8340	16/04/1999	1999	Holyoak	From Map/Ortho	Holyoak_h - derived from sketch map
7	Garter Hill	80690	340650	F84	F8040	30/09/2003	2003	Holyoak	GPS	
7	Garter Hill	81840	340890	F84	F8140	30/09/2003	2003	Holyoak	GPS	
7	Garter Hill	81880	340810	F84	F8140	30/09/2003	2003	Holyoak	GPS	
7	Garter Hill	82060	340690	F84	F8240	30/09/2003	2003	Holyoak	GPS	
7	Garter Hill	82610	340700	F84	F8240	30/09/2003	2003	Holyoak	GPS	
7	Garter Hill	81065	340671	F84	F8140	04/07/2006	2006	Lockhart	GPS	
7	Garter Hill	80482.696	341107.2	F84	F8041	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 1 (GH1)
7	Garter Hill	80280.245	340735.23	F84	F8040	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 2 (GH2)
7	Garter Hill	80864.842	340714.92	F84	F8040	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 3 (GH3)
7	Garter Hill	80989.366	340646.64	F84	F8040	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 4 (GH4)
7	Garter Hill	80609.588	340897.22	F84	F8040	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 5 (GH5)
7	Garter Hill	82156.328	340104.24	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 6 (GH6)
7	Garter Hill	81638.72	340180.7	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 7 (GH7)
7	Garter Hill	80293.696	340730.22	F84	F8040	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
7	Garter Hill	82170.296	340030.55	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82168.939	340032.04	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82169.438	340032.1	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82157.214	340103.67	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82155.82	340105.45	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82157.705	340105.58	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82159.215	340105.57	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82158.024	340103.1	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82175.743	340105.15	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	82203.531	340069.34	F84	F8240	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81614.931	340176.31	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81614.396	340174.97	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81614.374	340175.21	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81614.474	340175.4	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81616.491	340174.81	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81638.994	340180.46	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81640.059	340183.75	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81585.027	340258.34	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	81584.667	340259.01	F84	F8140	21/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
7	Garter Hill	80421.633	340810.28	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80670.356	340965.36	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80651.821	340949.85	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80630.791	340943.18	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80610.397	340917.63	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80557.011	340879.58	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
7	Garter Hill (Glenamoy Bog Complex)	80487.67	340855.2	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80462.771	340839.31	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80477.577	340950.46	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80459.02	340971.26	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80430.732	341011.96	F84	F8041	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80425.021	341104.06	F84	F8041	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80376.683	341085.69	F84	F8041	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80372.742	341094.33	F84	F8041	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80259.494	341046.96	F84	F8041	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80186.135	340910.88	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80296.941	340730.32	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80800.599	340627.39	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80943.842	340545.29	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80945.375	340544.49	F84	F8040	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	81026.805	340561.14	F84	F8140	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	81127.822	340633.11	F84	F8140	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	81213.045	340677.2	F84	F8140	12/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80483.536	341107.06	F84	F8041	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
7	Garter Hill	80280.496	340735.28	F84	F8040	14/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
8a	Doolough (Mullet / Blacksod Bay Complex)	73612	322434	F72	F7322	08/04/1998	1998	Lockhart	From Map/Ortho	Derived from Ortho - not Grid Ref. from Site Card
8a	Doolough	73600	322300	F72	F7322	17/04/1999	1999	Holyoak	GPS	
8a	Doolough	73612	322434	F72	F7322	27/04/2006	2006	Lockhart	From Map/Ortho	Relocated in 1998 Location - No GPS position recorded
8b	Dooyork (Mullet / Blacksod Bay Complex)	73716	320247	F72	F7320	09/04/1998	1998	Lockhart	From Map/Ortho	Derived from Orthos - not Grid Ref. from Site Card - Searched for by Holyoak 1999, but not relocated
9	North Inishkea (Inishkea Islands)	56608	323352	F52	F5623	29/07/1998	1998	Lockhart	Grid Ref from Record Card	
10	Doogort (Doogort Machair / Lough Doo)	70200	309500	F70	F7009	05/04/1998	1998	Lockhart	Grid Ref from Record Card	Searched for by Holyoak 1999 and Lockhart 2006, but not relocated
10	Doogort	70155	309620	F70	F7009	15/10/2009	2009	Campbell & Lockhart	GPS	
10	Doogort	70294	309692	F70	F7009	21/10/2010	2010	Campbell & Lockhart	GPS	43 thalli in a 25 x 50 cm quadrat - altitude was 4.258m with 0.5m accuracy
11	Keel Machair (Keel Machair / Menaun Cliffs)	64703	304393	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 1 (not numbered in record card)
11	Keel Machair	64665	304430	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 2 (not numbered in record card)
11	Keel Machair	64631	304468	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 3 (not numbered in record card)
11	Keel Machair	64594	304501	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 4 (not numbered in record card)
11	Keel Machair	64548	304530	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 5 (not numbered in record card)
11	Keel Machair	64500	304603	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 6 (not numbered in record card)
11	Keel Machair	64660	304504	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 7 (not numbered in record card)
11	Keel Machair	64684	304530	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 8 (not numbered in record card)
11	Keel Machair	64713	304498	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 9 (not numbered in record card)
11	Keel Machair	64713	304564	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 10 (not numbered in record card)
11	Keel Machair	64520	304917	F60	F6404	06/04/98	1998	Lockhart	From Map/Ortho	1998 Point 11 (not numbered in record card)

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
11	Keel Machair (Keel Machair / Menaun Cliffs)	64265	304741	F60	F6404	17/04/99	1999	Holyoak	From Map/Ortho	Holyoak Point a
11	Keel Machair	64352	304730	F60	F6404	17/04/99	1999	Holyoak	From Map/Ortho	Holyoak Point b
11	Keel Machair	64574	304510	F60	F6404	17/04/99	1999	Holyoak	From Map/Ortho	Holyoak Point c
11	Keel Machair	64704	304392	F60	F6404	17/04/99	1999	Holyoak	From Map/Ortho	Holyoak Point d
11	Keel Machair	64865	304880	F60	F6404	17/04/99	1999	Holyoak	From Map/Ortho	Holyoak Point e
11	Keel Machair	64280	304800	F60	F6404	28/06/03	2003	Holyoak	GPS	
11	Keel Machair	64580	304510	F60	F6404	28/06/03	2003	Holyoak	GPS	
11	Keel Machair	64380	304700	F60	F6404	28/06/03	2003	Holyoak	GPS	
11	Keel Machair	64330	304790	F60	F6404	28/06/03	2003	Holyoak	GPS	
11	Keel Machair	64575	304520	F60	F6404	07/07/06	2006	Lockhart	GPS	
11	Keel Machair	64718	304321	F60	F6404	07/07/06	2006	Lockhart	GPS	
12	Dooaghtry (Mweelrea / Sheeffry / Erriff Complex)	75183	268535	L76	L7568	25/11/97	1997	Lockhart	From Map/Ortho	Derived from Ortho - not Grid Ref. from Site Card
12	Dooaghtry	75154	268564	L76	L7568	25/11/97	1997	Lockhart	From Map/Ortho	Derived from Ortho - not Grid Ref. from Site Card
12	Dooaghtry	74947	268566	L76	L7468	25/11/97	1997	Lockhart	From Map/Ortho	Derived from Ortho - not Grid Ref. from Site Card
12	Dooaghtry	75000	269000	L76	L7569	20/04/99	1999	Holyoak & Lockhart	Grid Ref from Record Card	Grid Ref. from Record Card
12	Dooaghtry	75003	268640	L76	L7568	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75132	268735	L76	L7568	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75258	268772	L76	L7568	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75317	268868	L76	L7568	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75268	268911	L76	L7568	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75222	268987	L76	L7568	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75132	269036	L76	L7569	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75050	269000	L76	L7569	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74987	268960	L76	L7468	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74871	268874	L76	L7468	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74944	268788	L76	L7468	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74788	269069	L76	L7469	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74782	268980	L76	L7468	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74716	268924	L76	L7468	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75089	269112	L76	L7569	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	75026	269165	L76	L7569	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74947	269225	L76	L7469	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74887	269265	L76	L7469	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74794	269302	L76	L7469	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74691	269329	L76	L7469	20/04/99	1999	Holyoak & Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
12	Dooaghtry	74420	268810	L76	L7468	11/07/2003	2003	Holyoak	GPS	Grid Ref. for remainder of records for this visit - although it is a considerable distance (c.320m) from the main body of records
12	Dooaghtry	74740	268910	L76	L7468	11/07/2003	2003	Holyoak	GPS	GPS Record for 3 thalli found on 16/07/03 -
12	Dooaghtry	74760	268900	L76	L7468	11/07/2003	2003	Holyoak	GPS	GPS Record of hundreds of thalli found on 19/10/03

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
12	Dooaghtry (Mweelrea / Sheeffry / Erriff Complex)	75070	268525	L76	L7568	05/07/2006	2006	Lockhart	GPS	
12	Dooaghtry	75369	268719	L76	L7568	05/07/2006	2006	Lockhart	GPS	
12	Dooaghtry	75284.972	268634.65	L76	L7568	13/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
12	Dooaghtry	74827.298	268648.67	L76	L7468	13/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	Extent of cover
12	Dooaghtry	75288.45	268629.21	L76	L7568	13/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 1 (D1)
12	Dooaghtry	75027.492	268497.96	L76	L7568	13/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 2 (D2)
12	Dooaghtry	74857.854	268633.01	L76	L7468	13/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 3 (D3)
12	Dooaghtry	74916.855	268664.69	L76	L7468	13/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*; Plot 4 (D4)
12	Dooaghtry	75262.951	268887.3	L76	L7568	20/04/2010	2010	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 5 (D5)
12	Dooaghtry	75120.156	268607.98	L76	L7568	13/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	75386.294	268835.23	L76	L7568	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	75320.771	268885.51	L76	L7568	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	75293.977	268919.56	L76	L7568	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	75253.639	268927.99	L76	L7568	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	75113.325	269099.24	L76	L7569	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	74918.354	269261.94	L76	L7469	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	74632.84	268870.06	L76	L7468	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
12	Dooaghtry	74876.001	268845.68	L76	L7468	15/05/2009	2009	Campbell, Gaynor & Lockhart	GPS	*P. ralfsii*
13	Omey Island Machair (Omey Island Machair)	55835	256023	L55	L5556	08/10/1998	1998	Lockhart	From Map/Ortho	Derived from sketch map - Grid Ref. on Record Card L558560
13	Omey Island Machair	55920	255980	L55	L5555	08/10/1998	1998	Lockhart	From Map/Ortho	Derived from sketch map - Grid Ref. on Record Card L558560
13	Omey Island Machair	56275	255562	L55	L5655	08/10/1998	1998	Lockhart	From Map/Ortho	Derived from sketch map - Grid Ref. on Record Card L563555
13	Omey Island Machair	56330	255510	L55	L5655	09/10/2006	2006	Long	GPS	2 plants
13	Omey Island Machair	56320	255510	L55	L5655	09/10/2006	2006	Long	GPS	1 plant
13	Omey Island Machair	56290	255540	L55	L5655	09/10/2006	2006	Long	GPS	3 plants
13	Omey Island Machair	56373	255524	L55	L5655	03/11/2006	2006	Lockhart	GPS	
13	Omey Island Machair	55927	255983	L55	L5555	03/11/2006	2006	Lockhart	GPS	
14a	Mannin More (Slyne Head Peninsula)	60670	246090	L64	L6046	16/05/2004	2004	Holyoak	GPS	Holyoak Record (A)
14a	Mannin More	60730	246040	L64	L6046	16/05/2004	2004	Holyoak	GPS	Holyoak Record (B)
14a	Mannin More	60708	246080	L64	L6046	29/10/2006	2006	Lockhart	GPS	
14a	Mannin More	60627	246274	L64	L6046	29/10/2006	2006	Lockhart	GPS	
14a	Mannin More	60626	246313	L64	L6046	29/10/2006	2006	Lockhart	GPS	
14a	Mannin More	60613	246373	L64	L6046	29/10/2006	2006	Lockhart	GPS	
14a	Mannin More	60486	246412	L64	L6046	29/10/2006	2006	Lockhart	GPS	
14a	Mannin More	60686	246074	L64	L6046	29/10/2006	2006	Lockhart	GPS	
14b	Truska Machair (Slyne Head Peninsula)	58400	245300	L54	L5845	06/10/1998	1998	Lockhart	Grid Ref. from Record Card	Lockhart - Population 4
14b	Truska Machair	58400	245300	L54	L5845	21/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Record Card	Lockhart - Population 4

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
14b	Truska Machair (Slyne Head Peninsula)	58500	245800	L54	L5845	06/10/1998	1998	Lockhart	Grid Ref. from Record Card	Lockhart - Population 6
14b	Truska Machair	58700	246200	L54	L5846	06/10/1998	1998	Lockhart	Grid Ref. from Record Card	Lockhart - Population 5
14b	Truska Machair	58600	246100	L54	L5846	21/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Record Card	Truska Population 2
14b	Truska Machair	58500	246100	L54	L5846	21/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Record Card	Truska Population 2
14b	Truska Machair	58700	246100	L54	L5846	21/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Record Card	Truska Population 3 - corresponds to Holyoak Population 7 - corresponds to Campbell Population 3
14b	Truska Machair	58300	246500	L54	L5846	21/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Record Card	Truska Population 4 - corresponds to Holyoak Population 8
14b	Truska Machair	58350	246500	L54	L5846	21/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Record Card	Truska Population 4 - corresponds to Holyoak Population 9
14b	Truska Machair	58500	246000	L54	L5846	11/05/2004	2004	Holyoak	GPS	Truska Population 2 - corresponds to Campbell Population 1
14b	Truska Machair	58360	246230	L54	L5846	11/05/2004	2004	Holyoak	GPS	Truska Population 2 - corresponds to Campbell Population 1
14b	Truska Machair	58460	246170	L54	L5846	11/05/2004	2004	Holyoak	GPS	Truska Population 2 - corresponds to Campbell Population 1
14b	Truska Machair	58560	245930	L54	L5845	11/05/2004	2004	Holyoak	GPS	Truska Population 2 - corresponds to Campbell Population 1
14b	Truska Machair	58130	245610	L54	L5845	11/05/2004	2004	Holyoak	GPS	Truska Population 5 - corresponds to Campbell Population 2
14b	Truska Machair	58564	245981	L54	L5845	02/11/2006	2006	Lockhart	GPS	Truska Population 2 - corresponds to Campbell Population 1
14b	Truska Machair	58463	246154	L54	L5846	02/11/2006	2006	Lockhart	GPS	Truska Population 2 - corresponds to Campbell Population 1
14b	Truska Machair	58119	245620	L54	L5845	02/11/2006	2006	Lockhart	GPS	Truska Population 5 - corresponds to Campbell Population 2
14b	Truska Machair	58015	245692	L54	L5845	02/11/2006	2006	Lockhart	GPS	Truska Population 5 - corresponds to Campbell Population 2
14b	Truska Machair	58331.308	246281.98	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58339.528	246281.43	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58349.695	246282.96	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58352.577	246282.25	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58350.942	246289	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58354.577	246291.94	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58363.496	246288.88	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58369.368	246283.41	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58376.792	246282.38	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58394.558	246268.02	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58406.513	246249.58	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
14b	Truska Machair (Slyne Head Peninsula)	58416.662	246230.39	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58426.893	246201.32	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58435.154	246173.81	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58462.831	246177.78	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58477.458	246171.74	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58476.418	246130.34	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58520.989	246122.16	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58527.11	246090.82	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58529.987	246070.45	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58542.442	246050.55	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58555.19	246019.67	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58565.954	245996.52	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58568.022	245974.89	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58568.785	245952.57	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58540.116	245908.63	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58553.539	245923.58	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58534.849	245833.35	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58525.472	245778.11	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58510.488	245808.55	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58486.939	245926.92	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58431.884	245931.5	L54	L5845	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58422.529	246001.86	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58401.052	246075.31	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58378.823	246071.75	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58375.8	246092.94	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58377.069	246111.86	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58378.082	246139.47	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58374.555	246169.24	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58347.683	246237.68	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58340.043	246215.58	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58347.716	246193.04	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58344.055	246178.22	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58342.213	246154.97	L54	L5846	17/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58340.452	246173.68	L54	L5846	18/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Extent of cover; Truska Machair Population 1
14b	Truska Machair	58382.913	246138.2	L54	L5846	18/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Plot 1; Truska Machair Population 1
14b	Truska Machair	58335.316	246276.41	L54	L5846	18/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Plot 2; Truska Machair Population 1
14b	Truska Machair	58395.456	246223.24	L54	L5846	18/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Plot 3; Truska Machair Population 1
14b	Truska Machair	58515.714	245980.8	L54	L5845	18/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Plot 4; Truska Machair Population 1
14b	Truska Machair	58340.391	246173.86	L54	L5846	18/02/2009	2009	Campbell, Lynn, Lockhart & Smyth	GPS	Plot 5; Truska Machair Population 1
14b	Truska Machair	58368.947	246254.75	L54	L5846	24/03/2010	2010	Campbell & Lockhart	GPS	Plot 6; Truska Machair Population 1
14b	Truska Machair	58415.025	246199.31	L54	L5846	24/03/2010	2010	Campbell & Lockhart	GPS	Plot 7; Truska Machair Population 1
14b	Truska Machair	58463.368	246147.86	L54	L5846	24/03/2010	2010	Campbell & Lockhart	GPS	Plot 8; Truska Machair Population 1

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
14b	Truska Machair (Slyne Head Peninsula)	58567.886	245991.33	L54	L5845	24/03/2010	2010	Campbell & Lockhart	GPS	Plot 9; Truska Machair Population 1
14b	Truska Machair	58056.592	245647.16	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58029.944	245546.35	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58078.206	245632.85	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58091.657	245625.3	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58104.272	245610.63	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58115.272	245606.96	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58123.443	245597.54	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58137.429	245593.23	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58138.405	245604.26	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58138.907	245622.99	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58131.184	245632.6	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58114.023	245642.3	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58103.091	245644.78	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58092.949	245648.26	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58083.813	245658.37	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58070.978	245657.89	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58066.856	245669.52	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58062.386	245673.23	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58057.096	245674.8	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58046.896	245667.45	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58039.961	245663.75	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58033.214	245666.76	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58028.423	245672.36	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58025.275	245679.52	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58021.829	245687.11	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58017.695	245693.02	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58019.357	245701	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58015.902	245703.01	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58013.391	245709.48	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57985.499	245697.01	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57981.578	245690.61	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57985.62	245679.79	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57988.253	245674.19	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57997.125	245666.47	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57995.385	245661.39	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57990.918	245659.26	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57983.106	245660.12	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57975.331	245671.65	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57970.855	245666.46	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57970.968	245657.28	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	57979.364	245652.83	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
14b	Truska Machair (Slyne Head Peninsula)	57992.66	245650.23	L54	L5745	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58001.03	245654.82	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58021.851	245643.93	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58032.101	245645.18	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58056.359	245644.92	L54	L5845	19/02/2009	2009	Campbell & Lockhart	GPS	Extent of cover Truska Machair Population 2
14b	Truska Machair	58136.71	245629.03	L54	L5845	23/03/2010	2010	Campbell & Lockhart	GPS	Plot 1; Truska Machair Population 2
14b	Truska Machair	58083.87	245640.28	L54	L5845	23/03/2010	2010	Campbell & Lockhart	GPS	Plot 2; Truska Machair Population 2
14b	Truska Machair	58036.254	245647.57	L54	L5845	23/03/2010	2010	Campbell & Lockhart	GPS	Plot 3; Truska Machair Population 2
14b	Truska Machair	58024.643	245654.72	L54	L5845	23/03/2010	2010	Campbell & Lockhart	GPS	Plot 4; Truska Machair Population 2
14b	Truska Machair	57996.231	245639.41	L54	L5745	23/03/2010	2010	Campbell & Lockhart	GPS	Plot 5; Truska Machair Population 2
14b	Truska Machair	57975.256	245664.15	L54	L5745	23/03/2010	2010	Campbell & Lockhart	GPS	Plot 6; Truska Machair Population 2
14b	Truska Machair	58664.06	246079.46	L54	L5846	10/03/2011	2011	Campbell, Lynn & Smyth	GPS	Plot 1; Truska Machair Population 3
14c	Doon Hill/ W. of Aillebrack (Slyne Head Peninsula)	58380	242520	L54	L5842	10/11/1997	1997	Lockhart	Grid Ref. from Record Card	Aillebrack Population 1 - relocated by Lockhart 1998
14c	Doon Hill/ W. of Aillebrack	58380	242520	L54	L5842	06/10/1998	1998	Lockhart *et. al.*	Grid Ref. from Record Card	Aillebrack Population 1 - 1997 record relocated in 1998; Revisit to same X,Y, with different population count
14c	Doon Hill/ W. of Aillebrack	58000	242800	L54	L5842	06/10/1998	1998	Lockhart	Grid Ref. from Excel Sheet	Aillebrack Population 2 - corresponds to Holyoak Population 2
14c	Doon Hill/ W. of Aillebrack	58100	242900	L54	L5842	07/10/1998	1998	Lockhart	Grid Ref. from Excel Sheet	Aillebrack Population 2 - corresponds to Holyoak Population 3
14c	Doon Hill/ W. of Aillebrack	58000	242800	L54	L5842	22/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Excel Sheet	Holyoak Population 2 - Aillebrack Population 2 - Revisit to same X,Y, with different population count
14c	Doon Hill/ W. of Aillebrack	58100	242900	L54	L5842	22/04/1999	1999	Holyoak & Lockhart	Grid Ref. from Excel Sheet	Holyoak Population 3 - Aillebrack Population 3 - Revisit to same X,Y, with different population count
14c	Doon Hill/ W. of Aillebrack	58020	242800	L54	L5842	10/05/2004	2004	Holyoak	GPS	Ailliebrack Population 2
14c	Doon Hill/ W. of Aillebrack	57980	242790	L54	L5742	10/05/2004	2004	Holyoak	GPS	Ailliebrack Population 2
14c	Doon Hill/ W. of Aillebrack	58240	243110	L54	L5843	10/05/2004	2004	Holyoak	GPS	Ailliebrack Population 2
14c	Doon Hill/ W. of Aillebrack	58010	242720	L54	L5842	10/05/2004	2004	Holyoak	GPS	Ailliebrack Population 2
14c	Doon Hill/ W. of Aillebrack	58082	242944	L54	L5842	30/10/2006	2006	Lockhart	GPS	Ailliebrack Population 2
15	Murvey Machair (Murvey Machair)	66124	238840	L63	L6638	05/10/1998	1998	Lockhart	From Map/Ortho	Derived from Ortho - June 1998 Record - Grid Ref. on Record Card L662389
15	Murvey Machair	66178	238909	L63	L6638	05/10/1998	1998	Lockhart	From Map/Ortho	Derived from Ortho - October 1998 Record - Grid Ref. on Record Card L662389 - Also includes Relevé data
15	Murvey Machair	66100	239100	L63	L6639	22/04/1999	1999	Holyoak	Grid Ref from Record Card	Grid Ref from Record Card
15	Murvey Machair	66100	239200	L63	L6639	22/04/1999	1999	Holyoak	Grid Ref from Record Card	Grid Ref from Record Card
15	Murvey Machair	66130	239120	L63	L6639	09/05/2004	2004	Holyoak	GPS	Holyoak Point A
15	Murvey Machair	66200	239110	L63	L6639	09/05/2004	2004	Holyoak	GPS	Holyoak Point B

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
15	Murvey Machair (Murvey Machair)	66127	239121	L63	L6639	01/11/2006	2006	Lockhart	GPS	Stated in notes as relocated Holyoak Point A record - site *ca.* 4m from original record
15	Murvey Machair	66194	238891	L63	L6638	01/11/2006	2006	Lockhart	GPS	
16	Fanore (Black Head - Poulsallagh Complex)	113818	208806	M10	M1308	24/02/1998	1998	Lockhart	From Map/Ortho	Derived from Ortho
16	Fanore	113824	208799	M10	M1308	31/10/2006	2006	Lockhart	GPS	
16	Fanore	113828.08	208787.04	M10	M1308	17/04/2009	2009	Campbell	GPS	*P. ralfsii*; Plot 1 (F1)
16	Fanore	113823.34	208795.94	M10	M1308	17/04/2009	2009	Campbell	GPS	*P. ralfsii*; Plot 2 (F2)
16	Fanore	113824.79	208796.1	M10	M1308	22/03/2010	2010	Campbell & Lockhart	GPS	*P. ralfsii*
16	Fanore	113816.47	208806.38	M10	M1308	22/03/2010	2010	Campbell & Lockhart	GPS	*P. ralfsii*; Plot 3 (F3)
16	Fanore	113828.59	208787.24	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113827.97	208789.75	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113826.83	208791.42	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113824.39	208796.33	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113822.89	208798.54	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113822.4	208800.02	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113821.56	208801.5	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113818.76	208803.44	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113816.92	208808.28	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
16	Fanore	113816.71	208808.23	M10	M1308	17/04/2009	2009	Campbell	GPS	Extent of cover
17a	SW of Lough Naparka (Tralee Bay and Magharees Peninsula West to Cloghane)	61600	116800	Q61	Q6116	30/01/1998	1998	Lockhart	Grid Ref from Record Card	Grid Ref from Record Card
17b	Magherabeg (Tralee Bay and Magharees Peninsula West to Cloghane)	61200	115800	Q61	Q6115	28/01/1998	1998	Lockhart	Grid Ref from Record Card	Grid Ref from Record Card - Searched for again by Lockhart in 06 but not relocated
17b	Magherabeg	61300	115620	Q61	Q6115	22/05/2003	2003	Hodgetts	GPS	
17b	Magherabeg	61220	115780	Q61	Q6115	22/05/2003	2003	Hodgetts	GPS	
17b	Magherabeg	61320	115610	Q61	Q6115	22/05/2003	2003	Hodgetts	GPS	
17b	Magherabeg	61220	115850	Q61	Q6115	22/05/2003	2003	Hodgetts	GPS	
17b	Magherabeg	61180	115830	Q61	Q6115	22/05/2003	2003	Hodgetts	GPS	
17b	Magherabeg	61200	115820	Q61	Q6115	22/05/2003	2003	Hodgetts	GPS	
17b	Magherabeg	61200	115840	Q61	Q6115	22/05/2003	2003	Hodgetts	GPS	
17b	Magherabeg	61221.1	115851.33	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61201.617	115824.87	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61202.6	115810.29	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61183.075	115776.06	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61171.377	115747.23	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61221.757	115738.21	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61252.709	115749.29	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61226.315	115840.67	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61218.506	115805.87	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61243.621	115769.51	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
17b	Magherabeg	61221.252	115848.73	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 1 (M1)

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
17b	Magherabeg (Tralee Bay and Magharees Peninsula West to Cloghane)	61200.813	115821.27	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 2 (M2)
17b	Magherabeg	61221.405	115742.18	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 3 (M3)
17b	Magherabeg	61240.63	115770.88	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 4 (M4)
17b	Magherabeg	61181.396	115777.69	Q61	Q6115	02/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 5 (M5)
17c	Kilshannig (Tralee Bay and Magharees Peninsula West to Cloghane)	62030	117170	Q61	Q6217	21/05/2003	2003	Hodgetts	GPS	
18a	Inch (Castlemaine Harbour)	67405	97049	V69	V6697	26/09/1983	1983	Lockhart	Unknown	Point from last submission (66830, 97499) corrected to this location
18a	Inch	67457.907	97081.59	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67434.20	97073.23	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67414.10	97068.91	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67374.38	97069.07	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67371.13	97059.94	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67380.00	97039.11	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67373.92	97014.86	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67394.23	97018.20	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67407.40	97021.00	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67415.20	97025.45	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67425.89	97032.57	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67441.50	97037.83	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67447.63	97045.41	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67450.52	97053.50	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67453.87	97064.90	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
18a	Inch	67254.76	97078.03	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67259.07	97072.92	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67254.20	97066.68	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67244.48	97070.33	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67243.26	97058.85	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67229.96	97056.70	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67227.11	97051.94	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67215.21	97043.17	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67191.99	97053.07	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67166.25	97055.24	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67141.59	97049.28	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67189.18	97075.55	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67207.80	97090.53	V69	V6797	05/05/2010	2010	Campbell	GPS	Extent of cover
18a	Inch	67457.42	97081.47	V69	V6797	03/03/2009	2009	Campbell	GPS	*P. ralfsii*; Plot 1 (I1)
18a	Inch	67393.99	97079.35	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 2 (I2)
18a	Inch	67205.89	97129.08	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 3 (I3)
18a	Inch	67404.22	97040.09	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
18a	Inch (Castlemaine Harbour)	67252.21	97077.64	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*; Plot 4 (I4)
18a	Inch	67247.02	97076.80	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
18a	Inch	67117.86	97303.72	V69	V6797	03/03/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
18a	Inch	67197.96	97060.34	V69	V6797	05/05/2010	2010	Campbell	GPS	*P. ralfsii*
18a	Inch	67172.69	97066.83	V69	V6797	05/05/2010	2010	Campbell	GPS	*P. ralfsii*
18a	Inch	67403.02	97079.12	V69	V6797	26/02/2011	2011	Campbell	GPS	*P. ralfsii*
18a	Inch	67233.72	97077.54	V69	V6797	26/02/2011	2011	Campbell	GPS	*P. ralfsii*
18a	Inch	67232.76	97077.93	V69	V6797	26/02/2011	2011	Campbell	GPS	*P. ralfsii*
18b	Rosbehy (Castlemaine Harbour)	64750	91630	V69	V6491	22/05/2006	2006	Holyoak	GPS	
18b	Rosbehy	64760	91614	V69	V6491	12/10/2012	2012	Lockhart	GPS	S of small track to the south of road
18b	Rosbehy	64753	91612	V69	V6491	12/10/2012	2012	Lockhart	GPS	S of small track to the south of road
19	West of Inny Ferry (Ballinskelligs Bay and Inny Estuary)	47265	68175	V46	V4768	25/01/1998	1998	Lockhart	From Map/Ortho	Record relocated from Grid Ref. from Record card (V474682) and point from last submission which was in the wrong location
19	West of Inny Ferry	47255	68199	V46	V4768	25/01/1998	1998	Lockhart	From Map/Ortho	Record relocated from Grid Ref. from Record card (V474682) and point from last submission which was in the wrong location
20	North Bull (North Dublin Bay)	324451	237872	O23	O2437	16/06/1999	1999	Lockhart	From Map/Ortho	Derived from Ortho - not Grid Ref. from Site Card
20	North Bull	324481	237889	O23	O2437	16/06/1999	1999	Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
20	North Bull	324544	237916	O23	O2437	16/06/1999	1999	Lockhart	From Map/Ortho	Derived from Map / Ortho - Approx. location only
20	North Bull	324300	237770	O23	O2433	17/11/2004	2004	Holyoak	GPS	
20	North Bull	324360	237800	O23	O2437	17/11/2004	2004	Holyoak	GPS	
20	North Bull	324370	237810	O23	O2437	17/11/2004	2004	Holyoak	GPS	
20	North Bull	324421.18	237853.26	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324423.62	237854.41	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324423.45	237854.66	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324585.49	237933.52	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324937.38	238095.15	O23	O2438	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324935.06	238093.49	O23	O2438	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324934.93	238092.85	O23	O2438	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324421.92	237853.58	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324423.1	237855.26	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324585.73	237933.4	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324426.57	237852.2	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324424.5	237854.55	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Extent of cover
20	North Bull	324952.77	238095.73	O23	O2438	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324937.53	238094.53	O23	O2438	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324811.85	238036.32	O23	O2438	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324772.09	238014.33	O23	O2438	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324769.48	238011.48	O23	O2438	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324684.83	237971.11	O23	O2437	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*

Locality No.	Locality (SAC)	X	Y	10km Grid Sq.	1km Grid Sq.	Date	Year	Source	Accuracy	Notes
20	North Bull (North Dublin Bay)	324684.77	237971.07	O23	O2437	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324605.04	237939.26	O23	O2437	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324602.67	237937.46	O23	O2437	07/10/2009	2009	Campbell, Lockhart & Smyth	GPS	*P. ralfsii*
20	North Bull	324424.33	237851.49	O23	O2437	20/06/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
20	North Bull	324935.95	238093.5	O23	O2438	20/06/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
20	North Bull	324787.4	238026	O23	O2438	15/10/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
20	North Bull	324403.18	237838.13	O23	O2437	15/10/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
20	North Bull	324392.92	237829.72	O23	O2437	15/10/2010	2010	Campbell & Smyth	GPS	*P. ralfsii*
20	North Bull	324418.77	237851.92	O23	O2437	11/03/2011	2011	Campbell & Smyth	GPS	*P. ralfsii*
20	North Bull	324937	238095	O23	O2438	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Plot 1
20	North Bull	324935	238092	O23	O2438	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Plot 2
20	North Bull	324585	237933	O23	O2437	11/02/2009	2009	Campbell, Lockhart & Smyth	GPS	Plot 3
20	North Bull	324423	237855	O23	O2437	13/02/2009	2009	Campbell & Smyth	GPS	Plot 4
20	North Bull	324421	237853	O23	O2437	13/02/2009	2009	Campbell & Smyth	GPS	Plot 5
21	Barley Cove (Barley Cove To Ballyrisode Point)	76991	25984	V72	V7625	13/10/2012	2012	Lockhart	GPS	
21	Barley Cove	77060	25950	V72	V7725	13/10/2012	2012	Lockhart	GPS	
21	Barley Cove	76905	25834	V72	V7625	13/10/2012	2012	Lockhart	GPS	
21	Barley Cove	76903	25832	V72	V7625	13/10/2012	2012	Lockhart	GPS	