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Results of a monitoring survey and assessment of the conservation status of *Petalophyllum ralfsii* in Ireland 2023

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Front cover, small photographs from top row:

A deep water fly trap anemone *Phelliactis* sp., Yvonne Leahy; **Common Newt** *Lissotriton vulgaris*, Brian Nelson; **Limestone pavement**, Bricklieve Mountains, Co. Sligo, Andy Bleasdale; **Garden Tiger** *Arctia caja*, Brian Nelson; **Violet Crystalwort** *Riccia huebeneriana*, Robert Thompson; **Coastal heath**, Howth Head, Co. Dublin, Maurice Eakin; **Meadow Saffron** *Colchicum autumnale*, Lorcan Scott

Bottom photograph: **Petalwort** *Petalophyllum ralfsii*, Truska Machair, Co. Galway. David Holyoak



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Executive Summary

Petalophyllum ralfsii (Petalwort) is a thallose liverwort that grows in coastal habitats on damp compacted bare sand. This species is listed on Annex II of the EU Habitats Directive which, as well as requiring member states to designate protected areas for the species, also obliges them to monitor populations and report on their status on a six-yearly cycle. Therefore, in 2023, a survey was undertaken to monitor selected populations of this species in the Republic of Ireland and report on their status. *P. ralfsii* is known from 30 sites in the Republic of Ireland, all but one of which are located on the west coast. Twelve sites were selected for survey, four of which were surveyed during the previous round of monitoring and assessed as being in unfavourable condition or threatened, with the remaining eight sites not fully surveyed in the past. The remaining eighteen sites were not revisited, as they were assessed as being in favourable condition during the previous monitoring period (2013–2018). The populations were surveyed according to the established methodology used in previous monitoring surveys and the conservation status of each population was assessed under the parameters of Population, Habitat for the species and Future prospects to derive an overall assessment of each population. A National Conservation Assessment (NCA) of *P. ralfsii* across the Republic of Ireland was also undertaken, to contribute to Ireland's reporting obligations under Article 17 of the EU Habitats Directive. This national assessment is based on the Range, Population, Habitat for the species and Future prospects of the species across the country.

Thalli of *P. ralfsii* were found at five of the twelve sites surveyed, with no thalli found at the remaining seven sites. However, due to the ephemeral occurrence of this species, the absence of thalli does not necessarily mean that a population is automatically assessed as being of Unfavourable Conservation Status. If the Habitat for the species is assessed as Favourable, then the Population is assessed as Favourable, because if suitable habitat in good condition is present, the species may still be present. Suitable habitat in good condition was found to be present at three of the sites where no thalli were recorded, so these sites were assessed as Favourable on the Population parameter. The remaining four sites were assessed as Unfavourable – Inadequate on both the Population and Habitat for the species parameters. These sites were considered to be inappropriately grazed, with cattle grazing, rather than sheep grazing, leading to lack of suitable open habitat with a low sward, and eutrophication. The Future prospects of two of these sites were assessed as Unfavourable – Inadequate, as they did not show major damage from cattle grazing and a change in grazing regime has good potential to lead to conditions becoming suitable for *P. ralfsii* once again. The Future prospects of the other two sites with the habitat in poor condition were assessed as being Unfavourable – Bad, as these sites are heavily trampled and eutrophicated, with lower prospects of restoration to suitable condition, even with a change in grazing regime. Despite these issues at individual sites, the National Conservation Assessment indicates that the Range, Population, Habitat for the species and Future prospects at a national level are all Favourable and show a stable trend.

The highest priority conservation measures for *P. ralfsii* are to maintain suitable intensity and method of grazing, ideally with sheep, at sites where the habitat is currently suitable for the species and to modify the grazing regime where the habitat is not currently suitable. As *P. ralfsii* can benefit from some disturbance to maintain areas of suitable open, compacted sand and a low sward, the conservation of this species may, in future, come into conflict with efforts to improve the overall condition of the coastal habitats in which it occurs.

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1 Introduction

1.1 *Petalophyllum ralfsii*

Petalophyllum ralfsii (Wils.) Nees & Gottsche (Petalwort) is a thallose liverwort in the Petalophyllaceae family. It forms small thalli, typically less than 1 cm across, that resemble a miniature lettuce, due to the presence of erect, parallel lamellae on the upper surface of the thallus, which distinguish it from all other similar species (Atherton *et al.*, 2010; Paton, 1999). During the summer, the above-ground part of the plants often die back and the plant persists as underground tubers. Thalli are often solitary, but can also grow in mats consisting of many individuals. This is a dioicous species (male and female parts are borne on separate plants) and sporophytes are produced in spring and early summer. It is thought that, if environmental conditions become unsuitable for the species, spores can persist in the soil until conditions once again become suitable for the production of new plants. No specialised asexual propagules are known, but plants can reproduce clonally (Campbell *et al.*, 2019).

P. ralfsii is a pioneer species of damp and compacted bare sand, and of short turf in coastal areas. It grows mainly in base-rich dune slacks (EU Annex 1 Habitat 2190) and machair (EU Annex I Habitat 21A0), where inundation occurs during the winter. It has very specific hydrological requirements, and will not grow in the wettest parts of dune slacks, preferring a zone along the edge of slacks. It requires areas of open, stable ground to persist, which is typically maintained by coastal erosion, trampling and other disturbance by humans and especially by appropriate livestock grazing (Campbell *et al.*, 2019, Callaghan *et al.*, 2020). In machair habitat, it often occurs in damp areas where fresh wind-blown calcareous sand is deposited. For more in-depth information on the biology and ecology of *P. ralfsii* in Ireland, see Campbell *et al.* (2015, 2019).

Petalophyllum ralfsii has a Mediterranean-Atlantic distribution, occurring around the Mediterranean basin and along the Atlantic coast of Britain and Ireland (Blockeel *et al.*, 2014). It was previously thought to also occur in North America, but this is now regarded to be a distinct species (Stotler *et al.*, 2002). Ireland has probably the largest populations of this species in Europe, so has a special responsibility for its conservation (Campbell *et al.*, 2019). Within Ireland, most populations occur on the west coast, with the largest populations occurring in counties Donegal, Mayo and Galway. There is also one extant population known from the east coast, in County Dublin. A number of populations, in counties Mayo, Kerry and Dublin, as well as an anomalous inland record in County Leitrim, are no longer thought to be extant, having not been seen in many decades (Campbell *et al.*, 2019). Table 1 lists all 30 sites where *P. ralfsii* is considered to be extant in the Republic of Ireland.

Petalophyllum ralfsii is included on Annex II of the EU Habitats Directive and is legally protected in Ireland under the Flora Protection Order, 2022 (S.I. No. 235/2022) It is listed as Least Concern on the Red List of Irish bryophytes (Lockhart *et al.*, 2012a, b) and on the European Bryophyte Red List (Hodgetts *et al.*, 2019). This assessment as Least Concern is due, at least in part, from the fact that this species is more well studied and searched for than most bryophyte species, due to its inclusion in the EU Habitats Directive. However, it has undergone a decline across Europe and is listed as threatened on a number of national Red Lists, including in Britain, where it was assessed as Vulnerable (Callaghan, 2022).

1.2 Project rationale

As *P. ralfsii* is listed on Annex II of the EU Habitats Directive (92/43/EEC), Ireland is obliged to designate protected areas for this species, undertake surveillance of its populations under Article 11 of the Directive and report on its conservation status within the country under Article 17. Information is required on the parameters of Range, Population, Habitat for the species and Future prospects (DG Environment, 2023a), with field survey necessary to assess the last

three parameters. Reports under Article 17 of the Directive are produced on a six-year cycle, with the current reporting period running from 2019 to 2024. This is the fourth cycle in which the conservation status of *P. ralfsii* has been reported on, with much targeted fieldwork having been undertaken to search for and monitor *P. ralfsii* since 1998 (Campbell, 2013; Campbell *et al.*, 2015, 2019; Lockhart *et al.*, 2012a). For the previous reporting period of 2013–2018, the conservation status of *P. ralfsii* in Ireland was assessed as Favourable on all parameters (NPWS, 2019) and was considered to be stable.

Table 1 Details of each of the 30 known *Petalophyllum ralfsii* sites in Ireland, the county, SAC in which they occur and year of most recent survey.

Site code	Site name	County	SAC code	Last survey
Pr01	Rosses Point	Donegal	IE0000194	2018
Pr02	Rosepenna	Donegal	IE0001190	2018
Pr03	Tramore/Black Burrow/ SW of Dunfanaghy	Donegal	IE0000147	2023
Pr04a	Damph Beg	Donegal	IE0001141	2023
Pr04b	Derrybeg	Donegal	IE0001141	2023
Pr04c	Keadew Point	Donegal	IE0001141	2018
Pr05a	Dooley Point	Donegal	IE0000197	2023
Pr05b	Sheskinmore	Donegal	IE0000197	2018
Pr06	Bunduff Machair	Sligo	IE0000625	2018
Pr07	Garter Hill	Mayo	IE0000500	2018
Pr08a	Doolough Machair	Mayo	IE0000470	2018
Pr08b	Dooyork Machair	Mayo	IE0000470	2023
Pr09	North Inishkea	Mayo	IE0000507	2023
Pr10	Doogort Machair	Mayo	IE0001497	2023
Pr11	Keel Machair	Mayo	IE0001513	2018
Pr12	Dooaghtry	Mayo	IE0001932	2018
Pr13	Omey Island Machair	Galway	IE0001309	2018
Pr14a	Mannin More	Galway	IE0002074	2018
Pr14b	Truska Machair	Galway	IE0002074	2018
Pr14c	Doon Hill/West of Aillebrack	Galway	IE0002074	2018
Pr15	Murvey Machair	Galway	IE0002129	2023
Pr16	Fanore	Clare	IE0000020	2018
Pr17a	SW of Lough Naparka	Kerry	IE0002070	2023
Pr17b	Magherabeg	Kerry	IE0002070	2018
Pr17c	Kilshannig	Kerry	IE0002070	2023
Pr18a	Inch Spit	Kerry	IE0002074	2018
Pr18b	Rosbehy	Kerry	IE0002074	2023
Pr19	West of Inny Ferry	Kerry	IE0000335	2023
Pr20	North Bull	Dublin	IE0000206	2018
Pr21	Barley Cove	Cork	IE0001040	2018

The survey detailed in this report was commissioned by the National Parks and Wildlife Service (NPWS) to survey a subset of sites that were either not visited during the previous monitoring survey of Campbell *et al.* (2019) or were assessed as having Unfavourable Conservation Status during the previous monitoring period. One site, Pr15 Murvey Machair in Co. Galway, was included for survey as it has been heavily impacted by coastal erosion, although its

conservation status was assessed as Favourable by the previous survey, and three sites were included as they were assessed as Unfavourable – Inadequate. Eight further sites had not been visited during the past two monitoring periods and had therefore not been fully surveyed. The populations at the remaining 18 sites surveyed were assessed as being of Favourable Conservation Status since baseline surveys were established and over the past two Article 17 reporting periods and, as there is no evidence of a decline having taken place, the populations were not visited in order to save resources. A total of 12 sites were therefore selected for survey, eight of which have not been previously fully surveyed using the methodology of Campbell *et al.* (2015) and four of which were surveyed during the previous round of monitoring by Campbell *et al.* (2019). Informed by the results of this survey, the project also aimed to create a National Conservation Status Assessment (NCA) for *P. ralfsii* in Ireland, to fulfil reporting obligations under Article 17 of the EU Habitats Directive.

2 Methodology

2.1 Fieldwork preparation

Survey sites were selected as per Section 1.2; see Figure 1 for site locations. The methodology used by Campbell *et al.* (2019) during the previous round of monitoring was reviewed, with no significant changes deemed necessary. Any minor changes or other observations on the methodology are included in the relevant place in the following section. As *Petalophyllum ralfsii* is included on the Flora Protection Order, 2022, a licence was obtained from NPWS to enable minor disturbance of the habitat of *P. ralfsii* and allow collection of specimens if required for positive identification. The licence was considered necessary, although it was not envisaged that any significant disturbance of the habitat would be required or that any specimens would need to be collected to confirm identification, as *P. ralfsii* is typically easy to identify in the field in most instances. Local NPWS staff were contacted to inform them that the survey was taking place and for assistance with gaining access to sites, where necessary. The outputs of all previous surveys for *P. ralfsii* were collated and all previous records and extent polygons at the survey sites were mapped using QGIS. Maps of each survey site were printed for use in the field and a QField project was set up containing the data from previous surveys, as well as waypoint shapefiles for recording data on population extent, habitat condition, impacting activities and other notable species encountered. A site recording card was designed in Microsoft Word, to capture all relevant data about the site and a Turboveg database was created to record monitoring stop data. These files were loaded onto a ruggedised handheld tablet for use in the field.

2.2 Field survey

The survey was carried out mainly in late April and early May 2023. It is necessary to survey for *P. ralfsii* early in the year, due to the ephemeral nature of its occurrence, which means that it is typically not visible during the drier summer months. It is also easier to assess the hydrology of a site early in the year, when the water table is likely to be higher. Two sites were not surveyed at this time, due to unforeseen circumstances. North Inishkea Island was not surveyed until June, due to difficulties with boat access. By this time weather conditions were hot and dry, lowering the likelihood of finding *P. ralfsii*. The site west of Inny Ferry could not be surveyed when first visited in May 2023, due to the presence of bulls in the field from which *P. ralfsii* had previously been recorded, presenting a health and safety risk. This site was instead revisited in January 2024. The survey was carried out following the methodology of Campbell *et al.* (2019, 2015).

2.2.1 Mapping of extent of occurrence

At each survey site, all areas where *P. ralfsii* was previously recorded were searched carefully for its presence, as was any other suitable habitat in the vicinity, insofar as time allowed. Where

thalli were located, a target note was recorded and notes on the number of thalli and estimated area of suitable habitat at that location were recorded. If thalli occurred across a larger area, the extent of the area was marked by waypoints and the percentage of the area containing suitable habitat was estimated. Polygons were created later using QGIS, delineating the extent of occurrence, with the area of suitable habitat within the extent of occurrence calculated in m² by multiplying the area of extent of occurrence by the percentage of suitable habitat. If no thalli of *P. ralfsii* were found within a site, the location and estimated extent of any areas of suitable habitat was recorded and notes were taken on any impacting factors that may be contributing to the absence of *P. ralfsii*.

2.2.2 Monitoring stops

At sites where thalli of *P. ralfsii* were found, monitoring stops of 1 m x 1 m, containing *P. ralfsii*, were recorded in Turboveg. If population size allowed it, the target was to record four monitoring stops at each site. All vascular plant and bryophyte species present within the 1 m x 1 m area were recorded, although these data do not feed into the site assessment. A hole was dug alongside the plot to measure the depth to the water table, or to the bedrock if this was reached before the water table was reached. The vegetation height within the plot was measured and the percentage cover of grass, shrubs, forbs, bryophytes and bare ground was recorded. The total number of thalli within the plot was counted and the number of male and female thalli and thalli with mature or immature sporophytes was noted. The location of the plot was recorded within QField and two photos were taken of each plot, showing both close up and context views.

2.2.3 Site data

A site recording form was completed for each survey site. A site description, describing the physical attributes of the site, the habitats present, the population of *P. ralfsii* present and any other relevant information not included elsewhere within the form was compiled. Any changes to the site since the last time it was surveyed were noted, by comparison with the site reports of Campbell *et al.* (2019) or with the notes from previous surveys, contained within Campbell *et al.* (2015), if the site was not surveyed in 2015–2018. Notes were taken on the current management taking place at the site and any management recommendations that would be beneficial to *P. ralfsii* were also noted. General site photographs and close up photographs of *P. ralfsii* were taken and the location of any other notable species were recorded in QField. Impacting activities were recorded using the standard EU codes (DG Environment, 2023b), with the impact, intensity and percentage of habitat impacted noted. Conservation Measures (DG Environment, 2023c) required at each site, to address impacting activities seen to be having a negative impact, were also recorded.

Further site summary information was derived from the GIS data recorded and the monitoring stop data. The total extent of occurrence within each site and the area of suitable habitat within the extent of occurrence were calculated from the GIS data. Estimates of the total number of thalli present, as well as the total male and female thalli and thalli with mature and immature sporophytes were calculated by multiplying the mean number of thalli of each category recorded in the monitoring stops by the area of suitable habitat within the site. Site summary reports are included as Appendix 1.

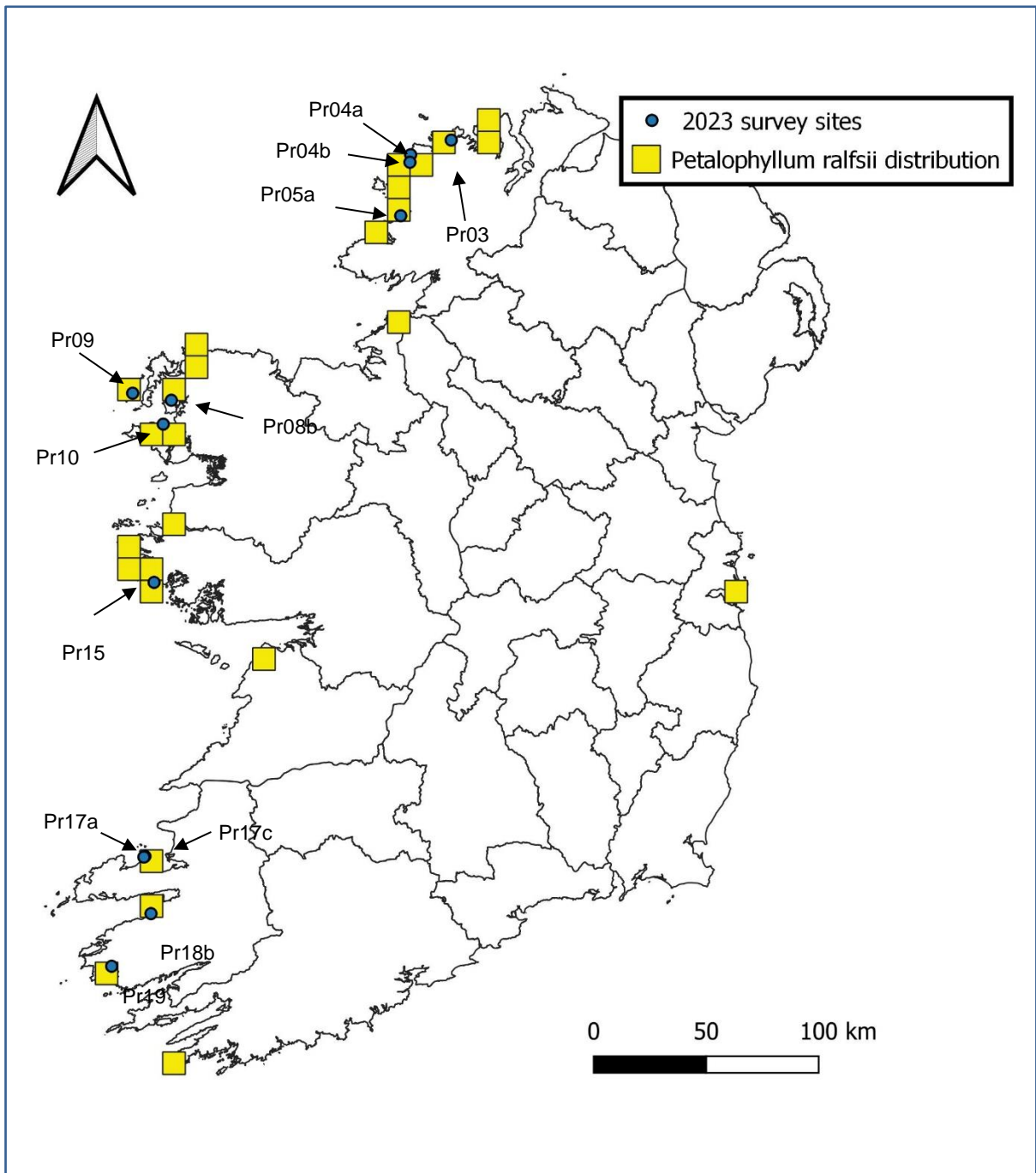


Figure 1 Locations of sites covered by the 2023 survey (blue dots) and distribution of *Petalophyllum ralfsii* (yellow grid cells). See Table 1 for site details.

2.3 Conservation assessments

Based upon the data collected in the field, the conservation status of each site was assessed under the categories of Population, Habitat for the species and Future prospects to give an overall site assessment.

2.3.1 Population assessment

Although the area covered by the population, in the form of area of suitable habitat, measured in m², was recorded for each site and the number of thalli was estimated, these were not used when carrying out the population assessment. Due to the unpredictability of the occurrence of *P. ralfsii* and its ephemeral nature, with populations varying greatly depending on climatic and other factors, comparison of population size and extent between years is of limited value. Therefore, the Population assessment was considered Favourable if *P. ralfsii* was found to be present within the site. If *P. ralfsii* was not found at a site, the Population was not automatically assessed as Unfavourable, as the absence of thalli on one occasion cannot be taken to mean that the species is no longer occurring at a site. Therefore, in sites where no thalli were found, the assessment for Population was linked to the Habitat for the species assessment, as outlined in Table 2. If no thalli of *P. ralfsii* have been found after searching in three consecutive six-year monitoring periods, then the extant status of the population should be reviewed, taking into account prevailing weather conditions, the time of year of survey and other factors.

Table 2 Criteria used in the Population assessment of *Petalophyllum ralfsii* for the 2023 monitoring survey (as per Campbell *et al.*, 2015, 2019).

Attribute	Population assessment
Thalli present	Favourable
Thalli not present and Habitat for Species assessment is Favourable	Favourable
Thalli not present and Habitat for Species assessment is Unfavourable – Inadequate	Unfavourable – Inadequate
Thalli not present and Habitat for Species assessment is Unfavourable – Bad	Unfavourable – Bad

2.3.2 Habitat for the species assessment

Attributes for assessing Habitat for the species (Table 3) were measured in the monitoring stops and are unchanged from those used by Campbell *et al.* (2019). Hydrology was assessed by digging a hole next to each plot until groundwater was reached and measuring the depth to the water level. If the bedrock was reached before hitting groundwater, then hydrology was assessed by pressing a hand into the ground and assessing whether it is damp to touch. The cover of grass and shrubs was assessed, as was the cover of open bare ground, with the target being low cover of grass and shrubs and relatively high cover of bare ground, which are conditions that favour *P. ralfsii*. The vegetation height was also used as an assessment attribute, with a low sward height required. The values obtained for these attributes were averaged across all monitoring stops at a site, with a pass or fail assigned for each attribute. The Habitat for the species was assessed as being in Favourable Conservation Status if five of these attributes passed, of Unfavourable – Inadequate status if between two and four of these attributes passed and of Unfavourable – Bad Conservation Status if it passed on zero or one attribute. Where a site only marginally failed on an attribute, and there was no obvious negative factor causing the failure, the attribute could be passed based on expert judgement. In sites where *P. ralfsii* was not refound, no monitoring stops were recorded, so the attributes were assessed at a site scale, based on areas of habitat that were considered to be suitable for the occurrence of the species.

Table 3 Habitat for the species assessment criteria used for *Petalophyllum ralfsii* during the 2023 survey (as per Campbell *et al.*, 2015, 2019).

Attribute	Method of assessment	Target for pass at site level
Hydrology	Measurement (cm) of depth to groundwater level from ground surface (hole dug beside plot)	Mean groundwater depth should be ≤ 80 cm from ground surface; if bedrock reached before groundwater, substrate should be damp to touch
Shrub cover (%)	Percent cover in a representative number of 1 m x 1 m monitoring plots	Mean percent shrub cover should not exceed 25%
Grass cover (%)	Percent cover in a representative number of 1 m x 1 m monitoring plots	Mean percent grass cover should not exceed 60%
Cover of bare ground (%)	Percent cover in a representative number of 1 m x 1 m monitoring plots	Mean percent cover of bare ground should be greater than 5%
Mean vegetation height (cm)	Height in centimetres in a representative number 1 m x 1 m monitoring plots	Mean vegetation height should not exceed 6 cm in machair habitat/9 cm in dune slack habitat
Habitat for the species assessment		Favourable = 5 attributes pass
		Unfavourable – Inadequate = 2–4 attributes pass
		Unfavourable – Bad = 0–1 attributes pass

2.3.3 Future prospects assessment

Future prospects at each site were evaluated with reference to the Population and Habitat for the species assessments, to determine if the conservation status of these sites is likely to change in the future. To enable this assessment, the current pressures, recorded using the standard codes of DG Environment (2023b), and threats that may cause an impact in the future were evaluated. Negative impacts were balanced against positive impacts and the current and future management of the site was taken into consideration. Conservation measures (DG Environment, 2023c) currently in place or planned, and those required, but not currently being carried out, were also factored into the assessment. In order for the Future prospects of a population to be assessed as Favourable, it was necessary that its prospects of survival in the long term should be judged as good and that the future trend of the Population and Habitat for the species are likely to be stable or improving. If it was deemed that severe impacts were expected in the future and that the Population and Habitat for the species were likely to significantly decline in the future, with eventual loss of the population, then the Future prospects were assessed as Unfavourable – Bad. An Unfavourable – Inadequate assessment was applied if the Future prospects were assessed as being between these two extremes.

2.4 National Conservation Assessment

The National Conservation Assessment was carried out using the assessment data collected in 2023, for sites that were included in this survey, and from 2015–2018 for sites that were not resurveyed in this round of monitoring. The conservation status was assessed based on the Range, Population, Habitat for the species and Future prospects on a national level (DG Environment, 2023a).

The Range was calculated on a 10 km grid basis in TM75 Irish Grid projection, based on the national distribution. A distribution map was derived primarily from population envelope polygons collected during the current monitoring survey and for the 18 sites not surveyed in 2023, from the 2015–2018 Rare Plants Monitoring Survey (Campbell *et al.*, 2019). For the seven sites in which no thalli were found by either of the abovementioned surveys, point occurrences collected between 1998 and 2006 during NPWS Rare and Threatened Bryophyte Surveys, held within the NPWS Rare and Threatened Bryophyte database, were used in creating the distribution map. Details of these records are compiled in Campbell *et al.* (2015). Due to the ephemeral nature of *P. ralfsii*, and its sporadic occurrence, these records were considered as current. The range was calculated based on these distribution data using ArcToolBox Range Tool and was refined using expert judgement. The Favourable Reference Range was taken as the Range reported during the last round of reporting in 2019.

The Population was reported using 1 km x 1 km grids as a reporting unit, as is recommended for non-vascular plants (DG Environment, 2023a). This is due to the difficulty involved in calculating populations of bryophytes, so that the number of individuals or extent of occupancy in m² is not an appropriate unit. This is especially the case for a species such as *Petalophyllum ralfsii*, due to its often unpredictable occurrence above ground. The number of occupied grid cells was derived by intersecting the occurrence points and extent polygons from this and previous surveys with the Irish National Grid. The Favourable Reference Population was set as the population reported in 2019.

The Habitat for the species was assessed based on the habitat assessments for the sites surveyed in 2023, plus the results of the 2015–2018 survey for those sites not surveyed in 2023, to enable an overall assessment of the habitat across all sites where the species occurs.

Informed by the current survey, current pressures and future threats, active at a national scale, and conservation measures, both in progress and required, were reported on. These then informed the Future prospects assessment. Both long-term and short-term trends were also reported for each parameter. The assessment results for each of the four parameters were combined to give an overall assessment of conservation status on a national level (Table 4).

Table 4 Evaluation matrix for the assessment of Conservation Status of Annex II species (adapted from DG Environment, 2023a).

Parameter	Conservation Status			
	Favourable ('green')	Unfavourable – Inadequate ('amber')	Unfavourable – Bad ('red')	Unknown
Range	Stable (loss and expansion in balance) or increasing <u>AND</u> not smaller than the 'favourable reference range'	Any other combination	Large decline: Equivalent to a loss of more than 1% per year within period specified by MS <u>OR</u> more than 10% below favourable reference range	No or insufficient reliable information available
Population	Population(s) not lower than 'favourable reference population' <u>AND</u> reproduction, mortality and age structure not deviating from normal (if data available)	Any other combination	Large decline: Equivalent to a loss of more than 1% per year within period specified by MS <u>AND</u> below 'favourable reference population' <u>OR</u> More than 25% below favourable reference population <u>OR</u> Reproduction, mortality and age structure strongly deviating from normal (if data available)	No or insufficient reliable information available
Habitat for the species	Area of habitat is sufficiently large (and stable or increasing) <u>AND</u> habitat quality is suitable for the long-term survival of the species	Any other combination	Area of habitat is clearly not sufficiently large to ensure the long-term survival of the species <u>OR</u> Habitat quality is bad, clearly not allowing long-term survival of the species	No or insufficient reliable information available
Future prospects	Main pressures and threats to the species not significant; species will remain viable on the long-term	Any other combination	Severe influence of pressures and threats to the species; very bad prospects for its future, long-term viability at risk.	No or insufficient reliable information available
Overall assessment of CS	All 'green' <u>OR</u> three 'green' and one 'unknown'	One or more 'amber' but no 'red'	One or more 'red'	Two or more 'unknown' combined with green or all 'unknown'

3 Results of the 2023 survey

3.1 Population

Of the 12 populations of *Petalophyllum ralfsii* surveyed in 2023, no thalli were found at seven sites (Table 5). Of these seven populations, three were surveyed between 2015 and 2018, when there were also no thalli found, with the other four sites not surveyed since between 1998 and 2010, when thalli were found at all of these sites. Due to the ephemeral nature of *P. ralfsii*, and its sporadic occurrence between years, failure to find thalli is not considered to be an indication that the species is no longer present, as long as at least a small amount of suitable habitat is present. At three of these sites, Pr09 North Inishkea, Pr10 Doogort Machair and Pr18b Rosbehy, suitable habitat, in Favourable condition (Table 6; see also Section 3.2), was present, and it is likely that *P. ralfsii* may be refound, if searched at the right time of year and after a favourable spell of weather. In particular, Pr09 North Inishkea was surveyed later in the year than is optimal, due to complications associated with accessing an offshore island, and thalli would be unlikely to be visible in the prevailing dry and sunny conditions when the survey was undertaken. At the four remaining sites where no thalli were found, the habitat did not show optimal suitability and only very small areas of marginally suitable habitat occurred.

Table 5 Summary of population survey results from the 2023 survey of 12 *Petalophyllum ralfsii* sites.

Site no.	Site name	Thalli present in 2023	Area of occupancy (m ²)	% suitable habitat	Area suitable habitat (m ²)	Mean no. of thalli in 1 x 1 m plots	Estimated total no. of thalli
Pr03	Tramore/Black Burrow/ SW of Dunfanaghy	Yes	50	15	7	4	30
Pr04a	Damph Beg	Yes	1	100	1	5	5
Pr04b	Derrybeg	Yes	745	5	37	7	261
Pr05a	Dooley Point	No	-	-	-	-	-
Pr08b	Dooyork Machair	Yes	321	15	48	5	241
Pr09	North Inishkea	No	-	-	-	-	-
Pr10	Doogort Machair	No	-	-	-	-	-
Pr15	Murvey Machair	Yes	2998	90	2698	43	116014
Pr17a	SW of Lough Naparka	No	-	-	-	-	-
Pr17c	Kilshannig	No	-	-	-	-	-
Pr18b	Rosbehy	No	-	-	-	-	-
Pr19	West of Inny Ferry	No	-	-	-	-	-

Campbell *et al.* (2019) state that if no thalli are found in three consecutive six-year monitoring periods, then the extant status of a population should be reviewed. This applies to Pr19 West of Inny Ferry, which has been searched on five occasions since 2009, with thalli last seen in 1998. Prior to this, *P. ralfsii* had not been seen at this site since 1890, illustrating the sporadic nature of the population at this location. Taking into account the sporadic nature of this population and the fact that the site may become suitable if a change in grazing regime from

cattle to sheep were implemented, it was decided that this population should still be considered as extant during this reporting period. However, if no thalli are recorded during the next reporting period and there is no prospect of a change in grazing regime, then it may be appropriate to consider this population extinct, particularly as it would then be more than 30 years since the last sighting of thalli. Thalli have not been observed at two other sites, Pr17a SW of Lough Naparka and Pr17c Kilshannig, in two consecutive six-year monitoring cycles, so if no thalli are observed during the next cycle, their status should be reviewed.

Although the estimated number of thalli present, area of occupancy and estimated area of suitable habitat were recorded at sites where *P. ralfsii* thalli was found, no inferences or conclusions can be drawn based on these figures and they were not used in the assessment, due to the variability of the occurrence of *P. ralfsii* between years depending on prevailing conditions. These figures and the area of occupancy polygons should only be taken as a general guide for future surveys of these populations.

Table 6 Summary of Population assessment of sites surveyed in 2023. See Section 3.2 for details of the Habitat assessments, upon which the population assessments for sites where thalli were not observed are dependent.

Site no.	Site name	Thalli present 2023	Habitat assessment result	Population assessment result
Pr03	Tramore/Black Burrow/SW of Dunfanaghy	Yes	Favourable	Favourable
Pr04a	Damph Beg	Yes	Favourable	Favourable
Pr04b	Derrybeg	Yes	Favourable	Favourable
Pr05a	Dooley Point	No	Unfavourable – Inadequate	Unfavourable – Inadequate
Pr08b	Dooyork Machair	Yes	Favourable	Favourable
Pr09	North Inishkea	No	Favourable	Favourable
Pr10	Doogort Machair	No	Favourable	Favourable
Pr15	Murvey Machair	Yes	Favourable	Favourable
Pr17a	SW of Lough Naparka	No	Unfavourable – Inadequate	Unfavourable – Inadequate
Pr17c	Kilshannig	No	Unfavourable – Inadequate	Unfavourable – Inadequate
Pr18b	Rosbehy	No	Favourable	Favourable
Pr19	West of Inny Ferry	No	Unfavourable – Inadequate	Unfavourable – Inadequate

3.2 Habitat for the species

All of the sites at which *P. ralfsii* thalli were found passed the Habitat assessment on all attributes (Table 7). Of the seven sites at which thalli were not located, a significant area of suitable habitat, in good condition, was present at three sites, which fulfilled all requirements to pass the assessment on all attributes. The other four sites, Pr05a Dooley Point, Pr17a SW of Lough Naparka, Pr17c Kilshannig and Pr19 West of Inny Ferry contained only very small patches of habitat of marginal suitability and all failed the Habitat for the species assessment on at least one attribute. These were all as a result of inappropriate grazing. At Pr05a Dooley Point, although sufficient bare ground was present and the sward was low, the cover of grass was generally high and the type of bare ground present was not suitable. Overall, the site showed evidence of eutrophication and excess poaching resulting from heavy cattle grazing, which are contributing to the habitat not being in favourable condition. Pr17c Kilshannig suffers

from similar issues, with inappropriate heavy cattle grazing leading to the loss of all but tiny patches of suitable habitat, with most habitat that may previously have been suitable heavily poached or covered by rank grass. In the small pockets where the habitat does show slight suitability, there was a high cover of grass, very little open bare ground and the vegetation was higher than is optimal. The other two sites that failed the Habitat for the species assessment, Pr17a SW of Lough Naparka and Pr19 West of Inny Ferry, did not show as severe signs of overgrazing and eutrophication as the already mentioned sites, but the habitat at both sites is currently mostly unsuitable for the occurrence of *P. ralfsii* as a result of inappropriate grazing by cattle, rather than sheep. Both sites contained insufficient bare ground and the grass cover at Pr17c was too high, indicating that the sward structure is suboptimal.

Table 7 Summary of Habitat for the species assessment of sites surveyed in 2023. Details of the assessment criteria are included in Section 2.3.2 above.

Site no.	Site name	Hydrology	Shrub cover	Grass cover	Bare ground cover	Vegetation height	Habitat assessment
Pr03	Tramore/Black Burrow/ SW of Dunfanaghy	Pass	Pass	Pass	Pass	Pass	Favourable
Pr04a	Damph Beg	Pass	Pass	Pass	Pass	Pass	Favourable
Pr04b	Derrybeg	Pass	Pass	Pass	Pass	Pass	Favourable
Pr05a	Dooley Point	Pass	Pass	Fail	Pass	Pass	Unfavourable – Inadequate
Pr08b	Dooyork Machair	Pass	Pass	Pass	Pass	Pass	Favourable
Pr09	North Inishkea	Pass	Pass	Pass	Pass	Pass	Favourable
Pr10	Doogort Machair	Pass	Pass	Pass	Pass	Pass	Favourable
Pr15	Murvey Machair	Pass	Pass	Pass	Pass	Pass	Favourable
Pr17a	SW of Lough Naparka	Pass	Pass	Pass	Fail	Pass	Unfavourable – Inadequate
Pr17c	Kilshannig	Pass	Pass	Fail	Fail	Fail	Unfavourable – Inadequate
Pr18b	Rosbehy	Pass	Pass	Pass	Pass	Pass	Favourable
Pr19	West of Inny Ferry	Pass	Pass	Fail	Fail	Pass	Unfavourable – Inadequate

3.3 Impacting activities

The primary impacts on the populations of *P. ralfsii* surveyed are livestock grazing, human disturbance and coastal erosion (Table 8). Specific impacts for each site are detailed in the site reports in Appendix 1. Although often negative for the habitat as a whole, PA07 Intensive grazing or overgrazing by livestock is typically beneficial in maintaining the open habitat with a low sward that favours this species. However, at four sites in particular (Pr05a Dooney Point, Pr17b SW of Lough Naparka, Pr17c Kilshannig and Pr19 West of Inny Ferry), inappropriate grazing by cattle has led to the possible extinction of *P. ralfsii*, through eutrophication, poaching and deposition of dung, as was also highlighted by the Habitat assessment (Section 3.2). This leads to unsuitable sward for *P. ralfsii*, without the required areas of damp, open compacted sand and only tiny fragments of suitable habitat remain. PA08 Extensive grazing or undergrazing by livestock and PF05 Sports, tourism and leisure activities are also impacting the habitat of this species at many sites, but are contributing to maintaining the habitat in suitable condition, so are generally considered to be positive impacts.

PM07 Natural processes without direct or indirect influence from human activities or climate change are both a pressure and threat, primarily in the form of succession to dense vegetation, leading to a loss of suitable habitat. This is apparent in at least one site, Pr19 West of Inny Ferry, and is a threat to many populations, if disturbance were to decrease. Coastal erosion also falls under this impact code and is a complex impact on populations of this species. At present at most sites, its impact is overall positive or neutral, as although suitable habitat is being lost to erosion, suitable open habitat is also being maintained and created, particularly through the deposition of wind-borne sand and suppression of dense vegetation. However, with the increasing impacts of climate change, through more frequent, intense storms and sea-level rise, the intensity of coastal erosion is increasing, and its impacts are being exacerbated. Therefore, it is likely that coastal erosion may become a negative impact on *P. ralfsii* in the future, at least at some of its locations. In that context, PJ07 Cyclones, storms and tornadoes due to climate change and PJ04 Sea-level rises due to climate change can be considered as threats to this species across its range.

Table 8 List of impacts (number of sites; n = 12), by intensity (high (H), medium (M), low (L)), % of the extent of occurrence affected and influence (positive (+), negative (-), neutral (0)), at the *Petalophyllum ralfsii* sites surveyed in 2023.

Impact code	Impact description	Intensity			% extent of occurrence affected					Influence			Total sites	
		H	M	L	<1	1–25	26–50	51–75	76–99	100	+	-		0
PA07	Intensive grazing or overgrazing by livestock	4	1						5		2	3		5
PA08	Extensive grazing or undergrazing by livestock	2	4				1		5		5		1	6
PA10	Livestock farming (without grazing)	1				1						1		1
PA25	Agriculture activities not referred to above	1	2			3					2	1		3
PC01	Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell)		1				1				1			1
PF04	Development and maintenance of beach areas for tourism and recreation		1						1		1			1
PF05	Sports, tourism and leisure activities		3	1		1	1		1	1	3		1	4
PF06	Deposition and treatment of waste/rubbish from built-up areas			2		2						2		2
PJ08	Soil degradation and erosion due to climate change	3				2	1						3	3
PM07	Natural processes without direct or indirect influence from human activities or climate change	1	6	2					9		7	2		9
Number of sites		12	18	5	0	9	1	3	1	21	21	9	5	35

3.4 Conservation measures

Conservation measures required for *Petalophyllum ralfsii* at the sites surveyed in 2023 are summarised in Table 9, with specific measures listed for each site in the site reports in Appendix 1. The main conservation measures identified as required at the sites surveyed are MA03 Maintain existing extensive agricultural practices and agricultural landscape features and MA05 Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning). The current management at eight out of the twelve sites, in most cases moderate to high levels of grazing by sheep, is maintaining the suitability of the site for *P. ralfsii* and keeping the management as is should ensure the future survival of these populations. This also applies to the majority of sites not surveyed in 2023. For the four sites where inappropriate grazing is currently not allowing the occurrence of suitable habitat in good condition for *P. ralfsii*, it would be necessary to adapt the grazing methods and intensity, by changing from cattle to sheep grazing, to restore the habitat to suitability. If coastal erosion continues to advance due to the impacts of climate change, the measure MJ01 Implement climate change mitigation measures will need to be put in place at sites that are directly exposed to the Atlantic Ocean, with this measure identified as necessary at two sites, Pr09 North Inishkea and Pr15 Murvey Machair, at present.

Table 9 Conservation measures required or in progress at the *Petalophyllum ralfsii* sites surveyed in 2023 and the pressures and threats addressed by these measures.

Measure code	Measure name	Number of sites	Pressure/threat addressed
MA03	Maintain existing extensive agricultural practices and agricultural landscape features	7	PM07
MA05	Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning)	4	PA07, PA10
MJ01	Implement climate change mitigation measures	2	PJ04, PJ07
MC01	Adapt/manage extraction of non-energy resources	1	PA25
MF10	Other measures related to residential, commercial, industrial and recreational infrastructures, operations and activities	1	PF06

3.5 Future prospects

The Future prospects assessment of each of the survey sites is detailed and justified in Table 10. Of the twelve sites surveyed, eight were assessed as having Favourable Future prospects and are expected to remain of good conservation status. Two further sites, Pr17a SW of Lough Naparka and Pr19 West of Inny Ferry, were assessed as having Unfavourable – Inadequate Future prospects, as the conservation status of *P. ralfsii* is currently poor, but if conservation measures were put in place, there are reasonable prospects that the site would once again become suitable. The habitat at Pr05b Dooey Point and Pr17c Kilshannig were assessed as having Unfavourable – Bad Future prospects, as the habitat is more heavily damaged by inappropriate grazing and may not return to suitable condition to support a healthy population of *P. ralfsii*, even if targeted measures were put in place.

Table 10 Details of the Future prospects assessments for *Petalophyllum ralfsii* sites surveyed in 2023 and the rationale for the assessment.

Site no.	Site name	Future prospects assessment	Rationale for assessment
Pr03	Tramore/Black Burrow/ SW of Dunfanaghy	Favourable	Grazing levels appear to be appropriate for the continued survival of this population, with sheep grazing and exposure combining to maintain suitable habitat.
Pr04a	Damph Beg	Favourable	Sheep grazing at appropriate levels and off-road driving to extract sand nearby appear to be maintaining appropriate conditions.
Pr04b	Derrybeg	Favourable	Extensive sheep grazing at this location is maintaining appropriate conditions at this site.
Pr05a	Dooley Point	Unfavourable – Bad	Heavy cattle grazing and associated nutrient input and trampling has rendered this site unsuitable for <i>P. ralfsii</i> and will continue to remain unsuitable unless significant rehabilitation and changes to grazing regimes take place.
Pr08b	Dooyork Machair	Favourable	This site appears to be appropriately grazed and should support suitable habitat into the future.
Pr09	North Inishkea	Favourable	Although <i>P. ralfsii</i> was not found, the habitat appears to be suitable, with no negative impacts noted. The timing of the survey during a spell of very dry weather may be responsible for the failure to find it. Therefore, its prospects of future survival at this location are considered good.
Pr10	Doogort Machair	Favourable	Despite <i>P. ralfsii</i> not being refound, no negative pressures or threats were recorded, and the habitat still retains suitability for it to occur.
Pr15	Murvey Machair	Favourable	Sheep grazing and exposure to coastal weather are maintaining suitable habitat across this site. Erosion is impacting the quality and extent of machair habitat overall, but is maintaining suitable conditions for <i>P. ralfsii</i> , so is overall neutral.
Pr17a	SW of Lough Naparka	Unfavourable – Inadequate	This site is only marginally suitable for <i>P. ralfsii</i> and is negatively impacted by cattle grazing at inappropriate levels. However, the habitat is still in moderately good condition, and may respond well to a change in grazing regime, to sheep, and <i>P. ralfsii</i> has the potential to re-emerge.
Pr17c	Kilshannig	Unfavourable – Bad	The condition of this site has continued to decline since the previous monitoring period, and only minute areas of marginally suitable habitat were observed, with the habitat in general in poor condition at this location, due to inappropriate cattle grazing and associated impacts. The prospects of restoring the population at this site are low.
Pr18b	Rosbehy	Favourable	Although <i>P. ralfsii</i> was not refound, all pressures recorded are having a positive impact in maintaining a reasonable area of potentially suitable habitat in the area where it was previously recorded.
Pr19	West of Inny Ferry	Unfavourable – Inadequate	This site is unchanged from previous monitoring period, with only marginal suitability and no thalli seen. The habitat is in moderately good condition, and may return to suitability with a change in management.

3.6 Overall site assessments

Overall, as eight of the 12 sites surveyed in 2023 were assessed as Favourable on all three parameters, these sites were assessed as being of Favourable Conservation Status overall (Table 11). The four sites that were not assessed as being of Favourable status were deemed unfavourable on all parameters, as outlined in the sections above. As Pr17a SW of Lough Naparka and Pr19 West of Inny Ferry were assessed as Unfavourable – Inadequate on all parameters, they were given an overall assessment of Unfavourable – Inadequate. As the Future prospects of Pr05a Dooley Point and Pr17c Kilshannig were assessed as Unfavourable – Bad, they were given an overall assessment of Unfavourable – Bad.

Table 11 Results of the overall site assessments of the 12 sites surveyed for *Petalophyllum ralfsii* in 2023, combining the assessments outlined above.

Site no.	Site name	Population	Habitat	Future prospects	Overall assessment
Pr03	Tramore/Black Burrow/ SW of Dunfanaghy	Favourable	Favourable	Favourable	Favourable
Pr04a	Damph Beg	Favourable	Favourable	Favourable	Favourable
Pr04b	Derrybeg	Favourable	Favourable	Favourable	Favourable
Pr05a	Dooley Point	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Bad	Unfavourable – Bad
Pr08b	Dooyork Machair	Favourable	Favourable	Favourable	Favourable
Pr09	North Inishkea	Favourable	Favourable	Favourable	Favourable
Pr10	Doogort Machair	Favourable	Favourable	Favourable	Favourable
Pr15	Murvey Machair	Favourable	Favourable	Favourable	Favourable
Pr17a	SW of Lough Naparka	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Inadequate
Pr17c	Kilshannig	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Bad	Unfavourable – Bad
Pr18b	Rosbehy	Favourable	Favourable	Favourable	Favourable
Pr19	West of Inny Ferry	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Inadequate	Unfavourable – Inadequate

3.7 National Conservation Assessment

The conservation status of *Petalophyllum ralfsii* at a national level was considered to be unchanged from the previous two reporting periods and was assessed as Favourable on all parameters, with stable short-term and long-term trends (Table 12).

As no new populations have been discovered and no populations have been lost, the Range (Figure 2) is unchanged from 2019, with 32 occupied 10 km x 10 km grid cells, equal to the Favourable Reference Range and shows a stable trend both short-term and long-term.

The Population is unchanged from the previous two reporting periods, with 49 1 km x 1 km grid cells occupied across 30 localities, equal to the Favourable Reference Population. The conservation status is therefore assessed as Favourable on the Population parameter and shows stable trends both short-term and long-term.

Although the habitat was assessed as being in poor condition at four sites, these sites only represent a very small proportion of the national habitat resource for *P. ralfsii*, so were not considered to be of sufficient significance to influence the national assessment of Habitat for the species. Additionally, three out of the four sites where the habitat is not in favourable condition are located within SACs which contain large populations of *P. ralfsii* in good condition. Therefore, the Habitat for the species was assessed as Favourable and shows stable short-term and long-term trends.

Similarly, the Future prospects were assessed as Favourable. Pressures and threats acting on the populations were not deemed to be having a significant impact on a national scale and the species is expected to remain viable in the future.

Table 12 Summary of the conservation status assessment of *Petalophyllum ralfsii* for the period 2019–2024.

Parameter	Conservation Status	Trend	Future prospects
Range	Favourable	Stable	Good
Habitat for the species	Favourable	Stable	Good
Population	Favourable	Stable	Good
Future prospects	Favourable		
Overall National Conservation Assessment	Favourable	Stable	

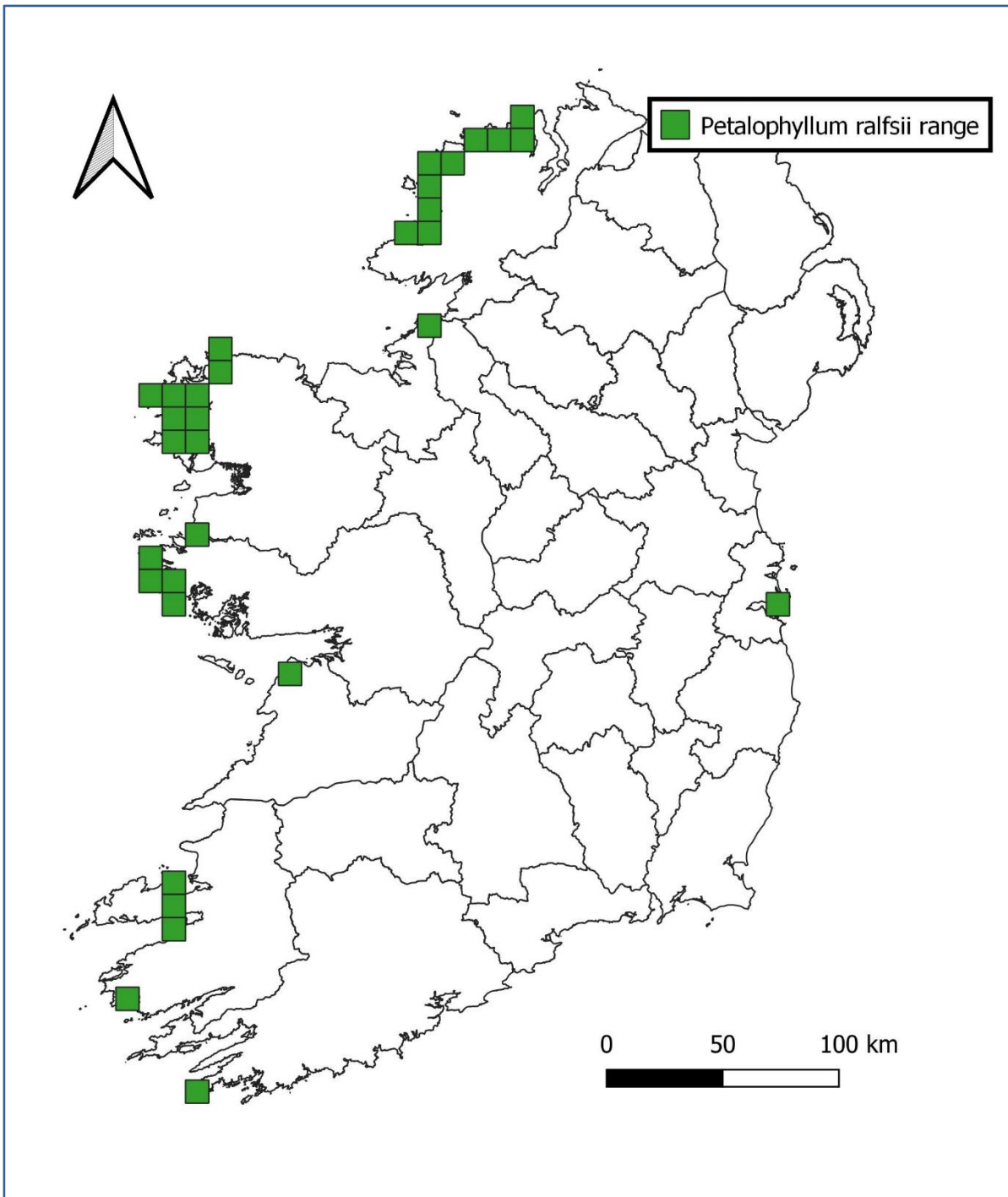


Figure 2 The Range of *Petalophyllum ralfsii* in Ireland (green grid squares), which is unchanged from previous reporting periods.

3.8 Populations within and outside the SAC network

As populations of Annex II species within SACs, for which the species is listed as a Qualifying Interest (QI) have a greater level of protection than those outside SACs, or within SACs for which they are not listed as QIs, it is important to report on the proportion of the national population that occurs within SACs and for which the species is selected as a QI. All populations of *P. ralfsii* occur within SACs for which the species is listed as a QI (Table 1), with the exception of small areas of extent at sites Pr05c Sheskinmore and Pr14c Doon Hill, West of Aillebrack.

4 Discussion

Overall, the conservation status of *Petalophyllum ralfsii* across Ireland was assessed as Favourable on all parameters, with strong populations occurring particularly in counties Galway, Mayo and Donegal. The key to maintaining these populations in good condition is to retain suitable open habitat and suitable hydrology. This open habitat is maintained by natural coastal system dynamics, including coastal erosion and sand deposition, appropriate grazing and some human activity, such as trampling and off-road driving. Grazing by sheep and rabbits is ideal for maintaining the habitat as suitable for this species, as it maintains a tightly cropped sward and open ground, as well as the creation of lightly trampled paths. Cattle grazing does not lead to the same tightly cropped sward and generally allows grass to grow longer, shading out any suitable bare ground. Higher levels of eutrophication created by heavy cattle grazing are also not suitable and heavy trampling by cattle tends to churn up the ground and does not allow the occurrence of stable, firm bare ground, which is favoured by *P. ralfsii*. These issues are apparent at the four sites that were assessed as having an Unfavourable Conservation Status, all of which are grazed by cattle, and require modification of the grazing regime. The grazing regime that is favourable for *P. ralfsii* is often detrimental to the overall condition of the dune slack or machair habitat within which it grows, as the level of grazing that encourages *P. ralfsii* is typically higher than is optimal for maintaining the surrounding habitat in good condition. Therefore, a careful balance must be struck between maintaining the habitat as suitable for *P. ralfsii* and optimising the overall condition of the surrounding habitat. Similarly, moderate levels of trampling by recreational users and off-road driving are detrimental to the habitat overall but can create suitable niches for *P. ralfsii*.

A number of the sites at which *P. ralfsii* occurs are within the target area of the LIFE on Machair project (Life on Machair, 2023). This project aims to improve the quality of machair and fixed dune habitats at sites in counties Galway, Mayo and Donegal, through engaging with farmers to adapt management, to improve habitat quality and undertake specific targeted conservation actions, mainly related to breeding waders and pollinators. *P. ralfsii* occurs within seven target areas of the project in the following SACs: Horn Head and Ringleaven SAC, Inishkea Islands SAC, Gweedore Bay and Islands SAC, Doogort Machair/Lough Doo SAC, Mweelrea/Sheefry Erriff SAC, Slyne Head Peninsula SAC and Murvey Machair SAC. Few specific actions of the project are directly focused on *P. ralfsii*, but many of the measures are likely to impact the species either directly or indirectly. Primary among these are changes in grazing regimes to improve habitat quality (corresponding to MA05 Adapt mowing, grazing and other equivalent agricultural activities (e.g. burning) and MA03 Maintain existing extensive agricultural practices and agricultural landscape features) and measures to control coastal erosion (MJ01 Implement climate change mitigation measures). While these measures are likely to have positive impacts on the habitat of *P. ralfsii*, there is also a potential for them to reduce the habitat suitability. If grazing levels become too low or if cessation of coastal erosion leads to loss of bare ground and a closed sward, a negative impact on *P. ralfsii* is possible. Therefore, it is important that these measures are implemented with regard for the requirements of *P. ralfsii* and their impacts are closely monitored. As part of the project, small exclosures are being set up to investigate the effects of grazing and trampling on *P. ralfsii* at Life on Machair sites, where it occurs.

Coastal erosion can be both beneficial and detrimental to *P. ralfsii* populations. Coastal erosion maintains open habitat through sand deposition and suppresses dense vegetation, while blowouts of sand, caused by large storms, can create suitable open habitat for large populations of *P. ralfsii* once they begin to stabilise, although the population may disappear once the open areas revegetate, unless the open ground is maintained. However, if coastal erosion is too active, the loss of habitat may be too rapid and the substrate may be too unstable, leaving no niche for *P. ralfsii* to grow in. This is not currently a significant issue at any sites, but may become a threat if the frequency and intensity of coastal storms increases due to climate change in the future.

Measures to control coastal erosion or to improve the condition of coastal habitats through a reduction in grazing and human impacts may be detrimental to *P. ralfsii* populations, as a loss

of suitable habitat may result. Any such projects, working within sites where *P. ralfsii* occurs, should be carried out with full awareness of the *P. ralfsii* populations present and should ensure that the populations are not negatively impacted.

5 Conclusions and recommendations

Based on the results of this survey and assessment, a number of recommendations can be made to ensure the long-term survival of *P. ralfsii* in good condition across its range in Ireland. Although the conservation status is currently assessed as Favourable on all parameters, this cannot be taken for granted and can quickly change. For populations where the habitat is currently favourable and the management is considered suitable, it should be actively ensured that the management stays as is and the grazing regime does not change. In order for this to be successful, full cooperation and collaboration of landowners is required, to whom the importance of *P. ralfsii* and its particular requirements should be explained.

Sites that were not monitored in 2023 should be revisited and monitored during the next monitoring period. In particular, Pr20 North Bull should be resurveyed in the near future, due to its location within Dublin City, which results in more potential pressures, such as nearby developments that may impact hydrology and changes in patterns of recreational use that may alter its habitat.

The seven sites where *P. ralfsii* was not found in 2023 are also a priority for future monitoring. Although the habitat appeared to be in good condition at three of these sites (Pr09 North Inishkea, Pr10 Doogort Machair and Pr18b Rosbehy), if *P. ralfsii* is not refound by future monitoring, investigations should be undertaken into whether management or other impacts, that may have been overlooked by this survey, are responsible for the absence of *P. ralfsii*. To maximise the likelihood of finding thalli, these sites should be visited when weather and other conditions are ideal for the growth of *P. ralfsii*.

At the four sites (Pr05a Dooley Point, Pr17a SW of Lough Naparka, Pr17c Kilshannig and Pr19 West of Inny Ferry) where the Habitat for the species was assessed as being in unfavourable condition, leading to unfavourable assessments for Population and Future prospects, conservation measures should be put in place to restore the habitat to suitable condition. This could be achieved through changing the grazing regime from cattle to sheep, with the aim of grazing the sites more appropriately. A targeted plan would need to be developed for each site and any changes in grazing regime would need to be carried out in close consultation and full cooperation with the landowners at each site.

It should be ensured that any projects that focus on reducing coastal erosion or improving the condition of coastal habitats within sites where populations of *P. ralfsii* occur are fully aware of the presence of *P. ralfsii* and take its specific habitat requirements into account when planning and undertaking actions. At a minimum, it should be ensured that the actions of these projects do not negatively impact *P. ralfsii* and ideally these projects should include specific targeted measures to ensure the survival of *P. ralfsii* and the maintenance of its habitat in good condition.

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7 Appendix 1 Site reports

Site name	Tramore/Black Burrow/SW of Dunfanaghy	Site number	PR03
County	Donegal	SAC site code	0000147
Dates surveyed	26/04/2023	Surveyors	RH EK
Area of occupancy (m²)	7.5	Estimated number of thalli	30
No. of monitoring stops	2		
Site description			
<p>This is an extensive coastal system, with dunes and sandy habitats occurring at significant distances from the sea up to 100 m altitude. <i>P. ralfsii</i> occurs on a knoll above the western end of the beach, where there are rocky outcrops overlain by a thin layer of compacted sand. Eleven thalli were observed at three locations across ca. 25 m of slope, on steep terraced slopes overlaying rocks above a steep drop, in a mixed bryophyte mat and on compacted sand. This location, which is at least partially kept open by exposure to the sea, may represent a more natural habitat for <i>P. ralfsii</i> than the anthropogenically disturbed or overgrazed dune slacks it typically occurs in in Ireland. Due to the steep habitat on which this population occurs, there is no groundwater close to the surface. Suitable habitat also occurs over a wide area on flushed sandy slopes at the eastern end of the beach, but no <i>P. ralfsii</i> was found.</p>			
Changes from baseline			
<p>No thalli were found at the location where they were recorded by Holyoak, which was carefully searched. The habitat and species present were unchanged from those described by Holyoak, but the habitat seemed dry and not optimally suitable for <i>P. ralfsii</i>. It is not likely to have changed significantly, and thalli may be found again at this location in the future.</p>			
Management notes			
<p>This site is grazed by sheep, with some erosion apparent. However, as it is also directly exposed to the sea, it is not possible to separate the impact of erosion from grazing and that from natural exposure, although both are likely to be contributing.</p>			
Management recommendations			
<p>It is likely that the conditions for this population are maintained by exposure to the sea, so sheep grazing levels should be maintained at a moderate rate to avoid excessive erosion that may result from severe overgrazing.</p>			
Other notable species			
<i>Gymnostomum viridulum</i>			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA08 Sheep grazing	+	M	75

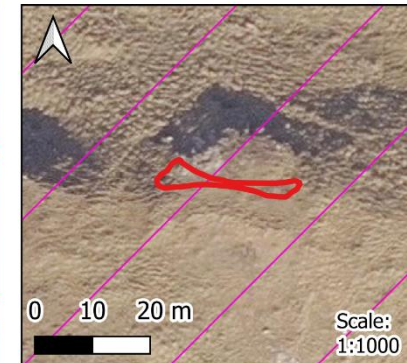
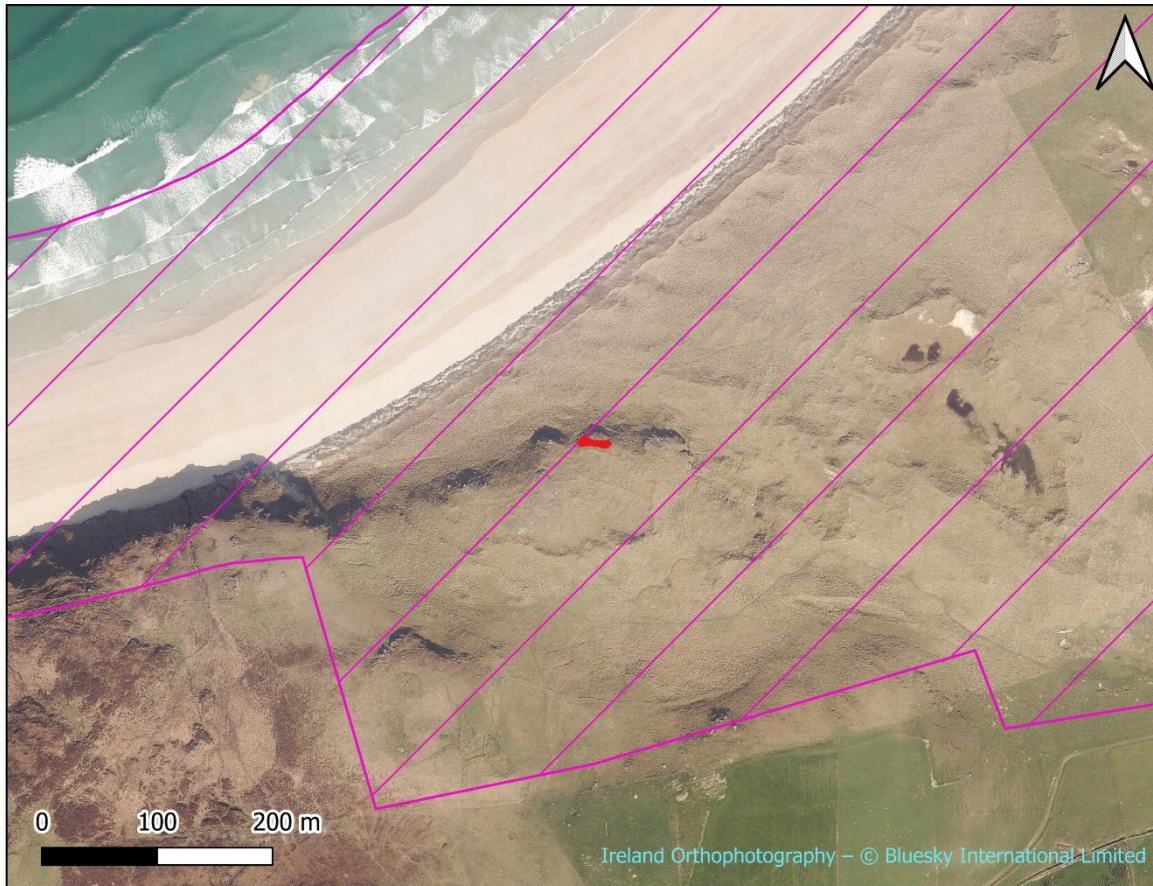
Conservation measure code	Conservation measure description
MA03	Maintain extensive grazing as is





Figure 1 View across location of *Petalophyllum ralfsii* above Tramore.



Figure 2 Close-up of habitat of *Petalophyllum ralfsii* above Tramore.



Legend:	
	Population extent
	Horn Head And Rinclevan SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr03 Tramore/Black Burrow/ SW of Dunfanaghy	
Surveyor Initials:	
RHEK	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

IWM 156 (2024) *Petalophyllum ralfsii* monitoring and assessment

Site name	Damph Beg	Site number	PR04a
County	Donegal	SAC site code	0001141
Dates surveyed	24/04/2023	Surveyors	RH EK
Area of occupancy (m²)	1	Estimated number of thalli	5
No. of monitoring stops	1		
Site description			
<p>This is a broad open area of dunes and machair. <i>Petalophyllum ralfsii</i> occurs in a narrow, elevated slack between dunes, which is perched ca 3 m above a larger wetter slack. Vehicle tracks run through this slack, leading to an area where sand has been extracted. Five thalli were found in a 1 x 1 m area along these tracks, but nowhere else in the relatively small area of habitat that showed suitability. Further searches in the vicinity yielded only small patches of partially suitable habitat.</p>			
Changes from baseline			
The habitat is the same as previously described, with sand extraction ongoing.			
Management notes			
<p>Rutting and compaction from driving on habitat is keeping it suitable, although if the extraction becomes more extensive the population of <i>P. ralfsii</i> may be negatively impacted. Although sheep were not seen, grazing is also maintaining the habitat in suitable condition for <i>P. ralfsii</i>.</p>			
Management recommendations			
<p>Ensure that habitat remains open, but also that sand extraction does not spread to the area where <i>P. ralfsii</i> occurs and eliminate the population. Grazing by sheep should be maintained at current levels.</p>			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PC01 Off-road driving for sand extraction	+	M	75
PM07 Rabbit grazing	+	L	100
PF06 Dumping	-	L	10
PA08 Sheep grazing	+	M	100

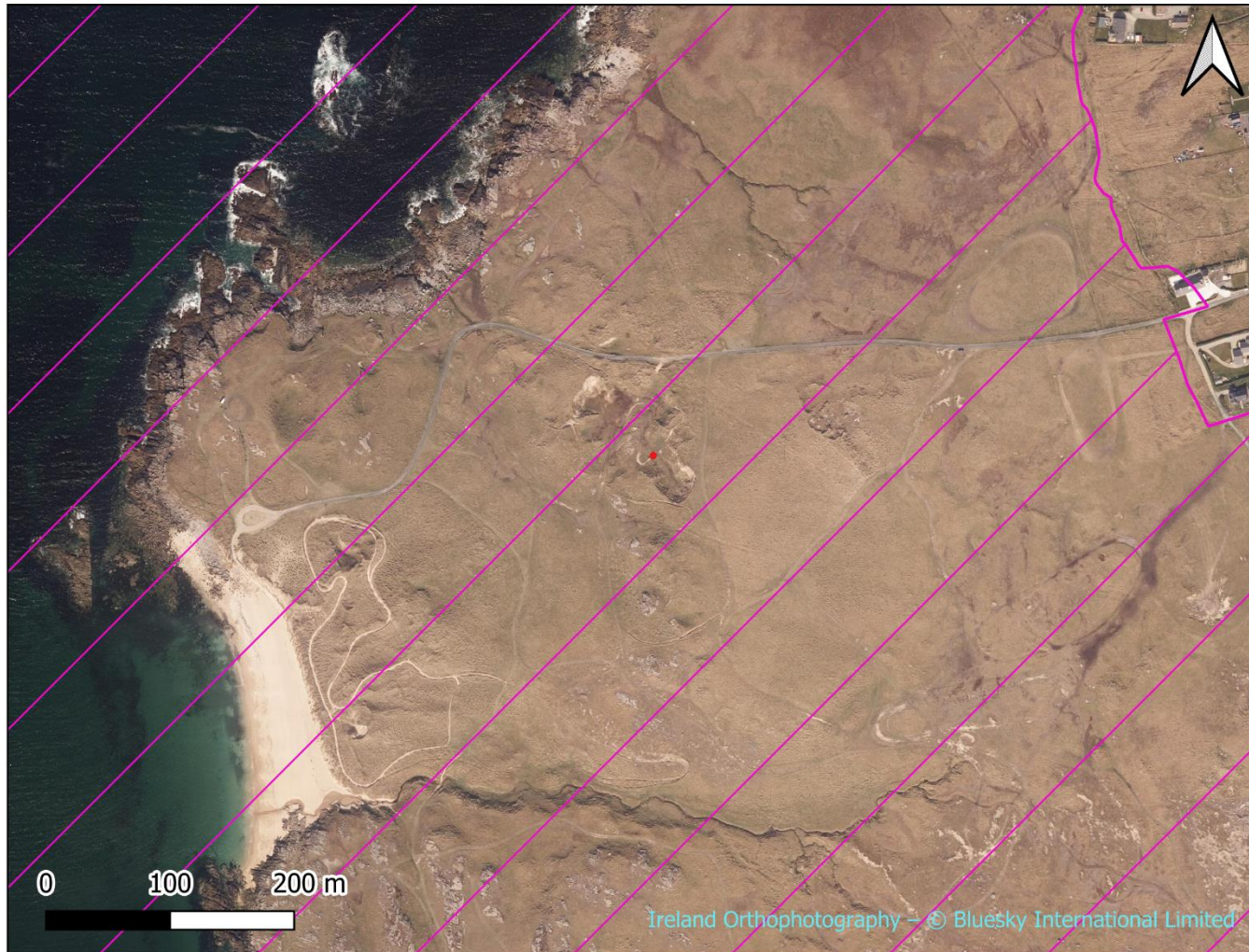
Conservation measure code	Conservation measure description
MC01	Ensure that sand extraction does not impact population
MA03	Maintain extensive grazing



Figure 1 View of location of *Petalophyllum ralfsii* at Damph Beg.



Figure 2 Location of sand extraction from dune close to *Petalophyllum ralfsii* at Damp Beg.



Legend:	
	Population extent
	Gweedore Bay And Islands SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr04a Damph Beg	
Surveyor Initials:	
RHEK	
Projection: IREN95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Derrybeg	Site number	Pr04b
County	Donegal	SAC site code	0001141
Dates surveyed	25/04/2023	Surveyors	RH EK
Area of occupancy (m²)	37	Estimated number of thalli	261
No. of monitoring stops	4		
Site description			
<p>This is a broad coastal plain, with a complex of hillocks, dunes and slacks. <i>P. ralfsii</i> occurs in a relatively large slack adjacent to a small golf course, at three locations within <i>c</i> 100 m. At all locations, <i>P. ralfsii</i> occurs in a low, open bryophyte mat on small hillocks or along the bank of the slack, in a zone above the dampest part of the slack. The largest population is the northeastern one, which occurs across a large hillock within the slack and has multiple immature and mature sporophytes present. Other slacks in the site are mostly not suitable, with some small moderately suitable patches of habitat found in slacks, on flushed slopes and around rocks on hillocks, but no more thalli were found.</p>			
Changes from baseline			
<p>Overall, the site is unlikely to have changed greatly from when it was previously surveyed. Further populations were found to the southeast of the original location, within the same slack.</p>			
Management notes			
<p>The slack habitat, as well as the adjacent dunes and machair, is extensively damaged by offroad driving, but this is only marginally impacting the <i>P. ralfsii</i> populations recorded. Dumping of glass and garden waste has also occurred in the slack but is not impacting <i>P. ralfsii</i>. The dunes are used by walkers, but there is no evidence of impacts in the vicinity of <i>P. ralfsii</i>. Although sheep were not seen, this site is grazed in its entirety, which is maintaining suitable open habitat for <i>P. ralfsii</i>.</p>			
Management recommendations			
<p>Grazing intensity should be maintained as is and dumping of rubbish should be discouraged.</p>			
Other notable species			
<p><i>Abietinella abietina</i>, <i>Catoscopium nigratum</i></p>			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PF05 Offroad driving and walking	0	M	5
PM07 Rabbit grazing	+	M	100
PF06 Dumping	-	L	1
PA08 Sheep grazing	+	M	100

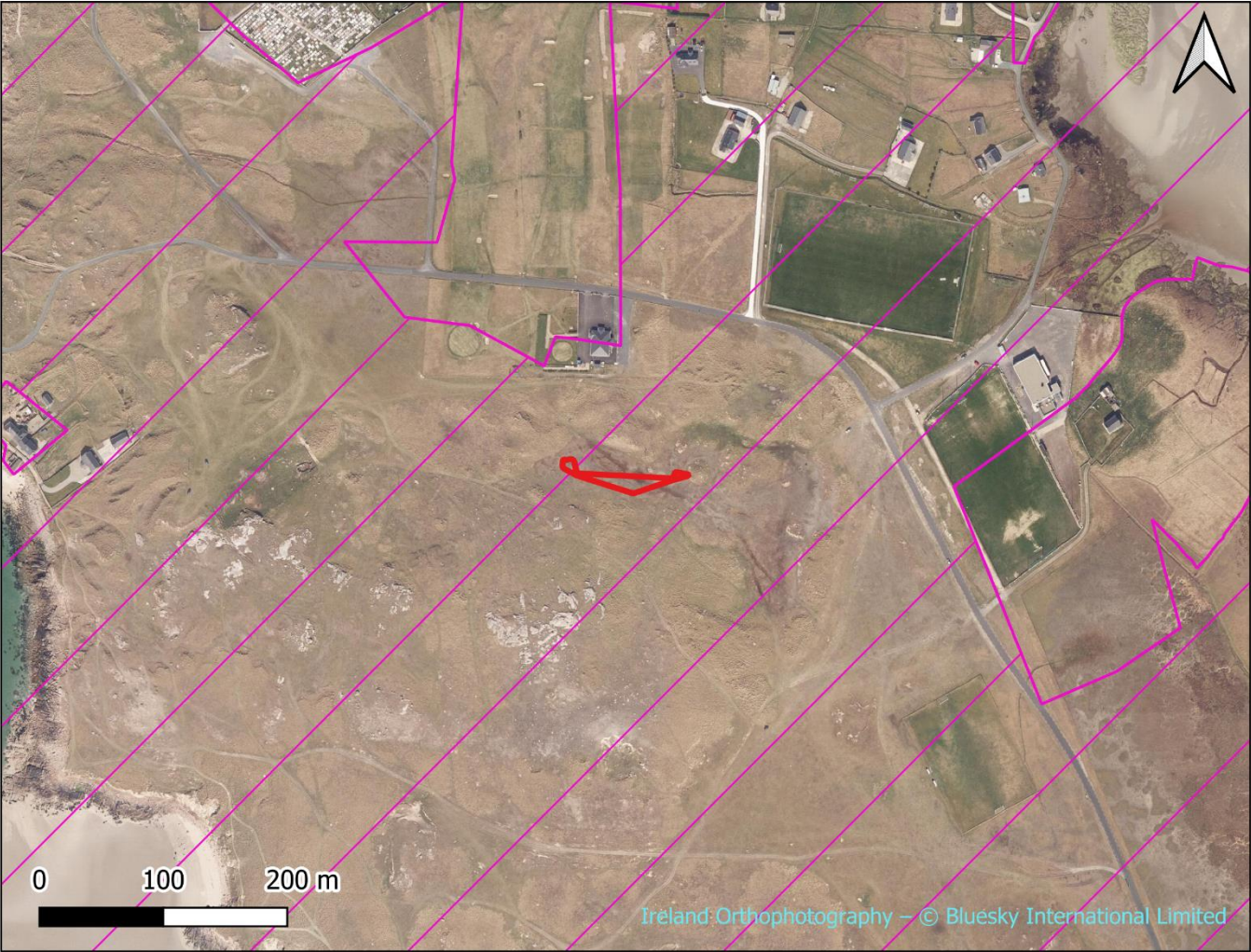
Conservation measure code	Conservation measure description
MA03	Maintain extensive grazing





Figure 1 Slack within which *Petalophyllum ralfsii* occurs at Derrybeg.



Figure 2 Habitat of *Petalophyllum ralfsii* at Derrybeg.



Legend:	
	Population extent
	Gweedore Bay And Islands SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr04b Derrybeg	
Surveyor Initials:	
RHEK	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Dooley Point	Site number	PR05a
County	Donegal	SAC site code	0000197
Dates surveyed	27/04/2023	Surveyors	RH EK
Area of occupancy (m²)	0	Estimated number of thalli	0
No. of monitoring stops	0		
Site description			
<p>This is a flat machair plain, behind a tall dune system. Most of this area is dry and grades into fixed dune, with some lower-lying wet areas present towards the north of the plain. These lower-lying areas are heavily grazed by cattle and are churned up by cow hooves and vehicle wheels. There are also a number of ring feeders with heavy trampling in their vicinity. There is very little suitable habitat for <i>P. ralfsii</i> at this site and it was not refound. Small patches of damp compacted sand with a mat of bryophytes were found at a small handful of locations along paths on old banks across the machair. Wheel ruts on the flats were unsuitable, with low sand content and no bryophyte cover.</p>			
Changes from baseline			
<p><i>P. ralfsii</i> was not refound at the locations of the previous records. At the more northerly location, a very small amount of suitable habitat, similar to that described by Holyoak was found, but no thalli were located. The southerly location was not suitable, occurring in a very heavily grazed and disturbed field with only tiny scraps of partially suitable habitat present. It was also heavily grazed during the previous survey, but it is likely that the habitat quality has declined due to continued unsuitable grazing.</p>			
Management notes			
<p>The levels of grazing at this site are unsustainably high, causing eutrophication and excessive disturbance of the habitat, greatly limiting the area of suitable habitat and possibly resulting in the loss of this species at this site.</p>			
Management recommendations			
<p>Reduce cattle grazing so that it is not negatively impacting the habitat, or change livestock species in the vicinity of the former location of <i>P. ralfsii</i> to sheep, which may restore the suitability of the site. Grazing at sustainable levels would be beneficial for <i>P. ralfsii</i>. Heavy rabbit grazing also occurs and is leading to erosion in places.</p>			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA07 Overgrazing by cattle	-	H	100
PA25 Offroad driving	-	H	25
PA10 Ring feeder	-	H	10
PM07 Rabbit grazing	-	H	100

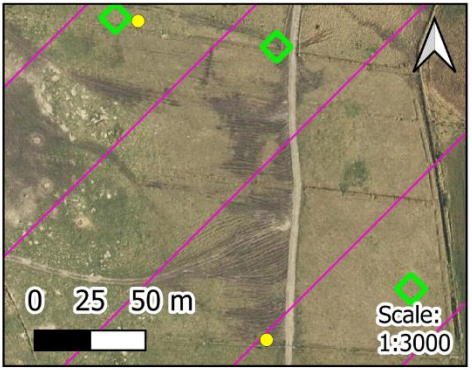
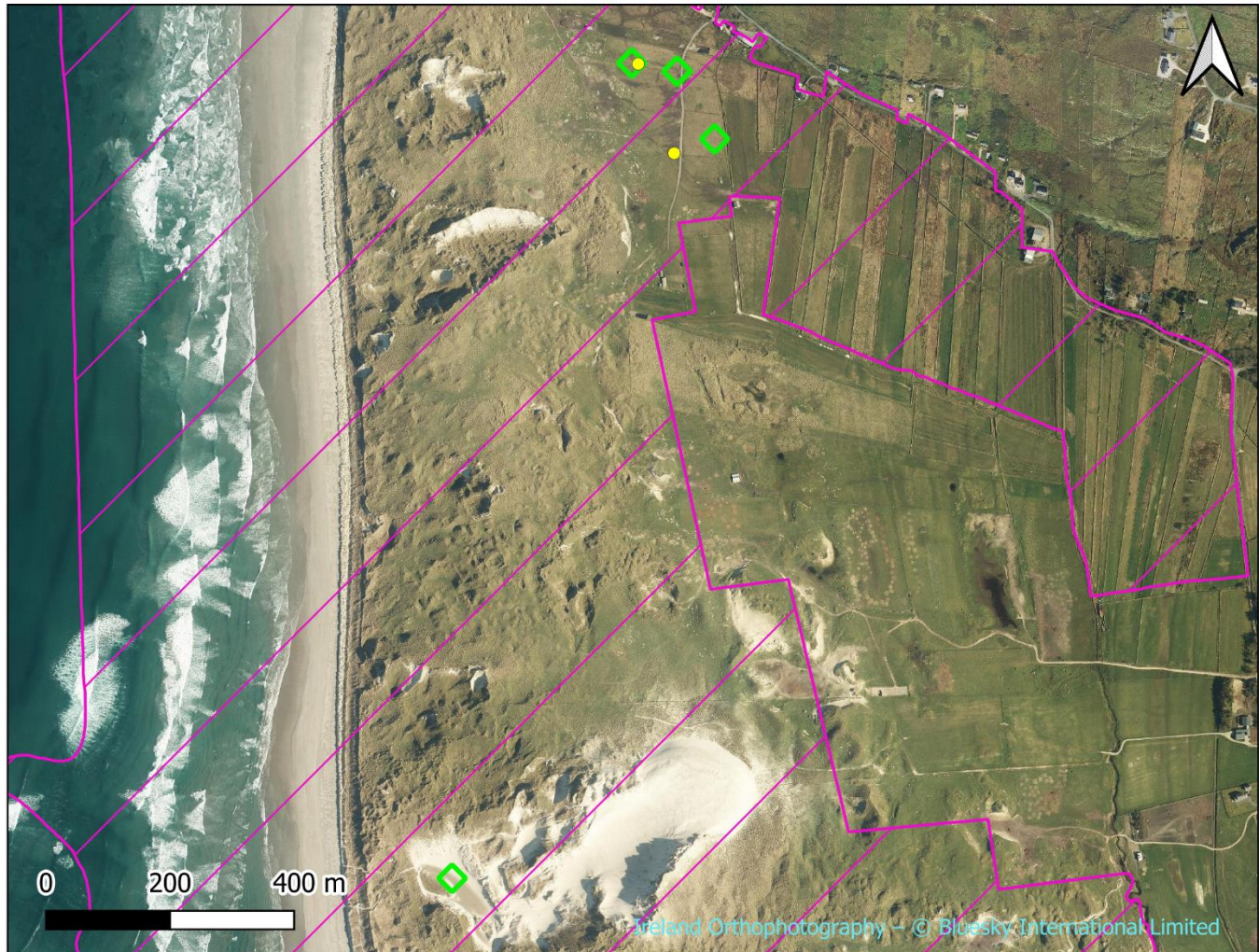
Conservation measure code	Conservation measure description
MA05	Change grazing regime from cattle to sheep and reduce grazing intensity and nutrient input



Figure 1 Raised bank along fenceline on machair plain at Dooley, that contains very small patches of partially suitable habitat for *Petalophyllum ralfsii*.



Figure 2 Heavily grazed machair plain at Dooley.



Legend:	
●	Previous records
◇	Suitable habitat noted in 2023
▨	West Of Ardara/Maas Road SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr05a Dooney Point	
Surveyor Initials:	
RHEK	
Projection: IREN95 / Irish Transverse Mercator	Scale of main map @ A4: 1:10,000
Drawn by: KMN	Date: 15/10/2024

Site name	Dooyork Machair	Site number	PR08b
County	Mayo	SAC site code	0000470
Dates surveyed	03/05/2023	Surveyors	RH EK
Area of occupancy (m²)	48	Estimated number of thalli	241
No. of monitoring stops	3		
Site description			
<p>A complex of coastal habitats occurs on the eastern side of Blacksod Bay, near Gweesalia. This is fronted by a line of dunes, which grades into a narrow machair plain, behind which there is an area of saltmarsh and freshwater marsh. Much of the machair plain is dry and unsuitable for <i>P. ralfsii</i>, but damp areas, interspersed with dry sandhills, occur in the western and northern part of the machair. <i>P. ralfsii</i> occurs sparingly on flats between sandhills, typically towards the edges of the flat area, where the ground is marginally higher. The more northerly damp flat area is more densely vegetated and contains little open ground suitable for the species.</p>			
Changes from baseline			
<p>The habitat is as described by Lockhart in 1998, with no changes apparent. The location of the point recorded by Lockhart is on higher, dry ground, which currently seems unsuitable for <i>P. ralfsii</i>, and may be the result of a mapping error. However, the habitat was noted as atypical in the original report, so the location may well be correct and represent an occurrence in atypical habitat..</p>			
Management notes			
<p>Cattle graze this site seasonally, with grazing levels seemingly appropriate for <i>P. ralfsii</i>. Offroad driving occurs on the site, but not close to the location of the suitable habitat.</p>			
Management recommendations			
<p>Grazing should be maintained as is, with an increase or decrease in grazing levels or frequency avoided.</p>			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA07 Intensive cattle grazing	+	M	100

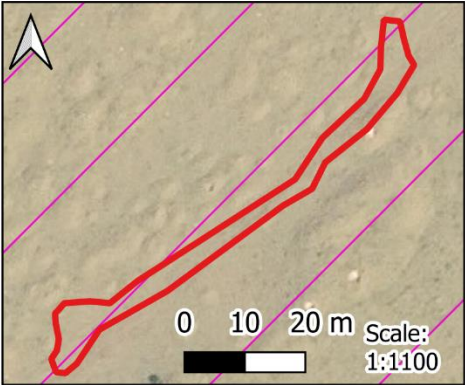
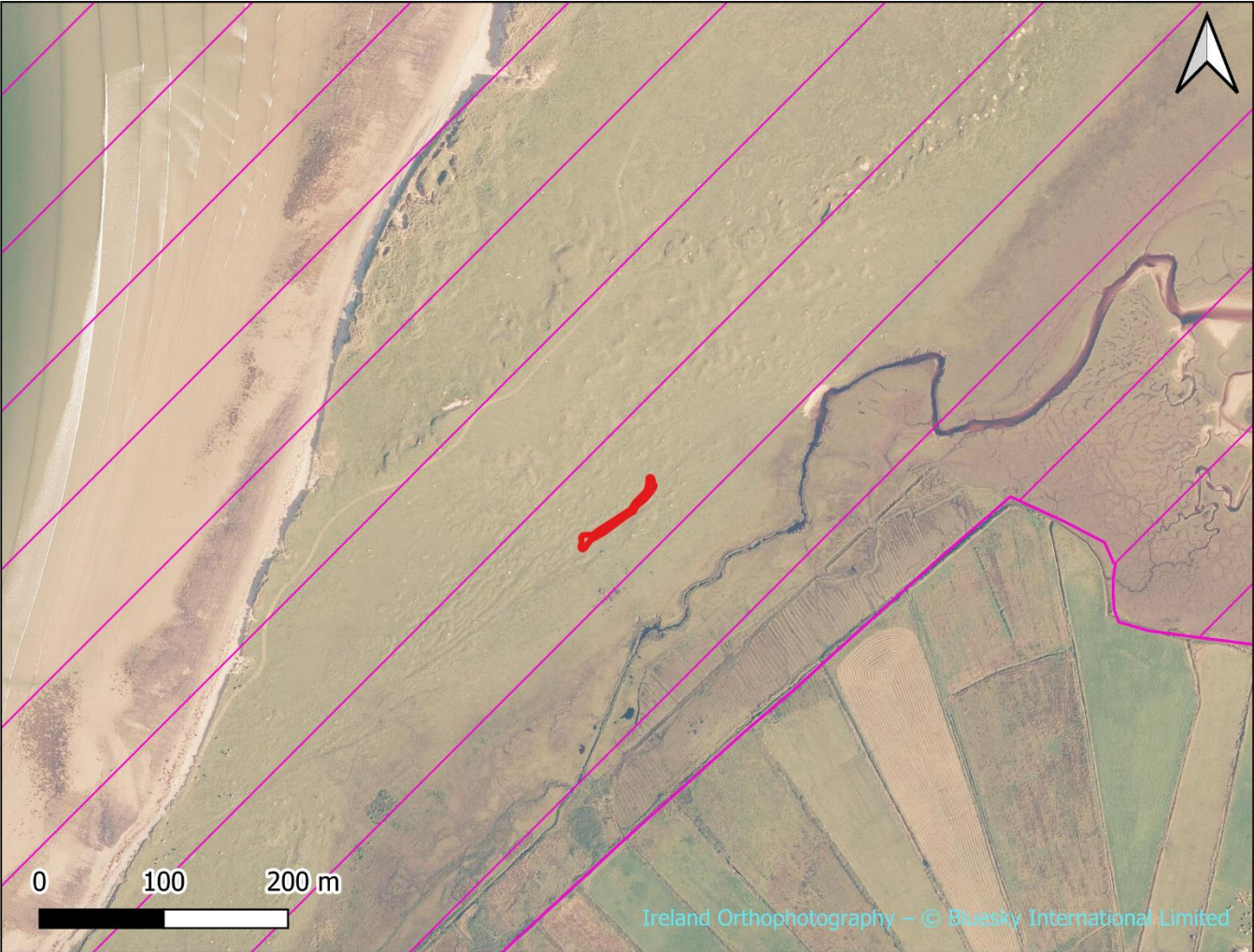
Conservation measure code	Conservation measure description
MA03	Maintain grazing regime as is



Figure 1 Damp machair plain at Dooyork on which *Petalophyllum ralfsii* occurs.



Figure 2 Habitat of *Petalophyllum ralfsii* at Dooyork.



Legend:

- Population extent
- Mullet/Blacksod Bay Complex SAC

Project:

Article 17 monitoring 2023

Map Title:

Petalophyllum ralfsii population Pr08b
Dooyork Machair

Surveyor Initials:

RHEK

Projection: IREN95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
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Drawn by: KMN	Date: 10/10/2024
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IWM 156 (2024) *Petalophyllum ralfsii* monitoring and assessment

Site name	North Inishkea	Site number	PR09
County	Mayo	SAC site code	0000507
Dates surveyed	13/06/2023	Surveyors	RH EK
Area of occupancy (m²)	0	Estimated number of thalli	0
No. of monitoring stops	0		
Site description			
<p>An undulating machair plain occurs on the northern side of the island, to the east of Doon Lough, between the sea and gentle slopes leading towards the middle of the island. Two damp runnels run down through this area towards the sea, with the ground leading into these runnels being damp and flushed. Away from these flushed areas, the ground grades into drier conditions, with the vegetation composition changing accordingly. Areas of eroded sand occur at the edge of this area, close to the sea, with a larger eroded area to the west, from which some wind-blown sand is spread. Suitable habitat for <i>Petalophyllum ralfsii</i> occurs along a number of sheep paths though this area, on small open patches in the damp machair and on slopes leading into the damp runnels. Due to the timing of the survey, during a prolonged spell of dry weather, <i>P. ralfsii</i> was not found, although there is no reason to believe that it is no longer present.</p>			
Changes from baseline			
<p>Although <i>P. ralfsii</i> was not refound, the habitat is the same as was described by Lockhart in 1999, with open sheep paths running through a damp machair plain and it may be refound if surveyed when weather conditions were more suitable.</p>			
Management notes			
<p>The entirety of the site is grazed by sheep at moderately high intensity. This island is included within the LIFE on Machair project, which aims to introduce sustainable grazing levels to improve the condition of the machair habitat, as well as address coastal erosion at this site. Coastal erosion is evident close to the location of the previous site, with a small amount of machair habitat lost beside the coast.</p>			
Management recommendations			
<p>To keep the habitat in optimal condition for <i>P. ralfsii</i>, grazing levels should not be reduced to levels that would eliminate open habitat for <i>P. ralfsii</i>. Any conservation measures should take the requirements of <i>P. ralfsii</i> into account. The presence of <i>P. ralfsii</i> should be established by a survey when conditions are more suitable.</p>			
Other notable species			
<p><i>Amblyodon dealbatus</i>, <i>Riccia cavernosa</i></p>			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA08 Sheep grazing	+	H	100
PJ08 Coastal erosion	0	H	5
PM07 Rabbit/hare grazing	+	L	100

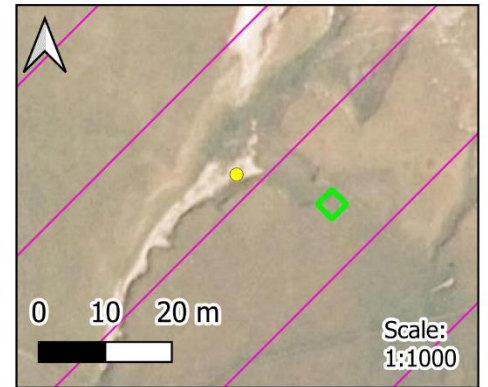
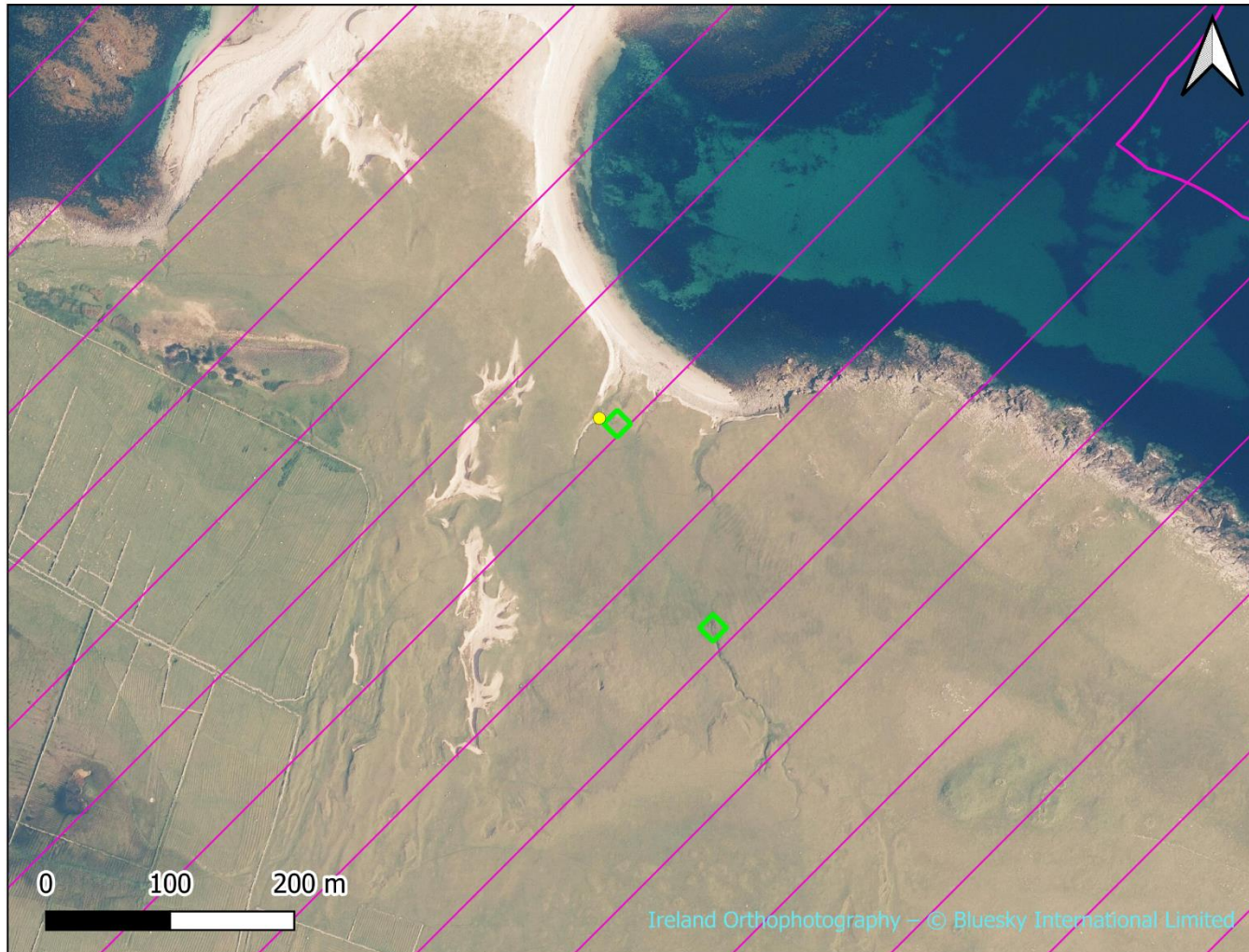
Conservation measure code	Conservation measure description
MJ01	Control coastal erosion exacerbated by climate change
MA03	Maintain grazing regime as is



Figure 1 Damp machair plain on North Inishkea where *Petalophyllum ralfsii* was previously found.



Figure 2 Sheep path with suitable habitat for *Petalophyllum ralfsii* on North Inishkea.



Legend:	
	Suitable habitat noted in 2023
	Previous records
	Inishkea Islands SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr09 North Inishkea	
Surveyor Initials:	
RHEK	
Projection: IREN95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Doogort Machair	Site number	PR10
County	Mayo	SAC site code	0001497
Dates surveyed	02/05/2023	Surveyors	RH EK NL
Area of occupancy (m²)	0	Estimated number of thalli	0
No. of monitoring stops	0		
Site description			
<p>This site is a large machair plain on the north side of Achill Island, with a fen area in its eastern part and low hummocks rising from wet flats and flushes in its western part. Suitable habitat for <i>P. ralfsii</i> occurs around the edges of the low hummocks, on slightly raised paths and along the edges of flushes running down to the shore. The upper parts of the hummocks are too dry, while the habitat on the flats is too wet and densely vegetated. Despite the presence of suitable habitat, <i>P. ralfsii</i> was not found, but is likely to still be present in small quantity.</p>			
Changes from baseline			
<p>The habitat present has changed little since previous surveys, although it has perhaps become more mature and stable, resulting in the vegetation becoming more closed, although suitable habitat still occurs in multiple locations.</p>			
Management notes			
<p>Sheep and cattle grazing occur across this site, at high intensity. This is likely to be beneficial to <i>P. ralfsii</i>, but not for the habitat overall. This site is within the Life on Machair project and will be targeted by measures to improve habitat quality in the coming years.</p>			
Management recommendations			
<p>To maintain the habitat of <i>P. ralfsii</i>, the grazing regime should be maintained as is. It is possible that a slight reduction in grazing intensity would not lead to a loss of habitat, but a significant reduction in intensity is likely to be detrimental for <i>P. ralfsii</i>.</p>			
Other notable species			
<p><i>Catospium nigratum</i>, <i>Moerckia flotoviana</i>, <i>Amblyodon dealbatus</i>,</p>			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA07 Intensive grazing	+	H	100
PJ08 Coastal erosion	0	H	5

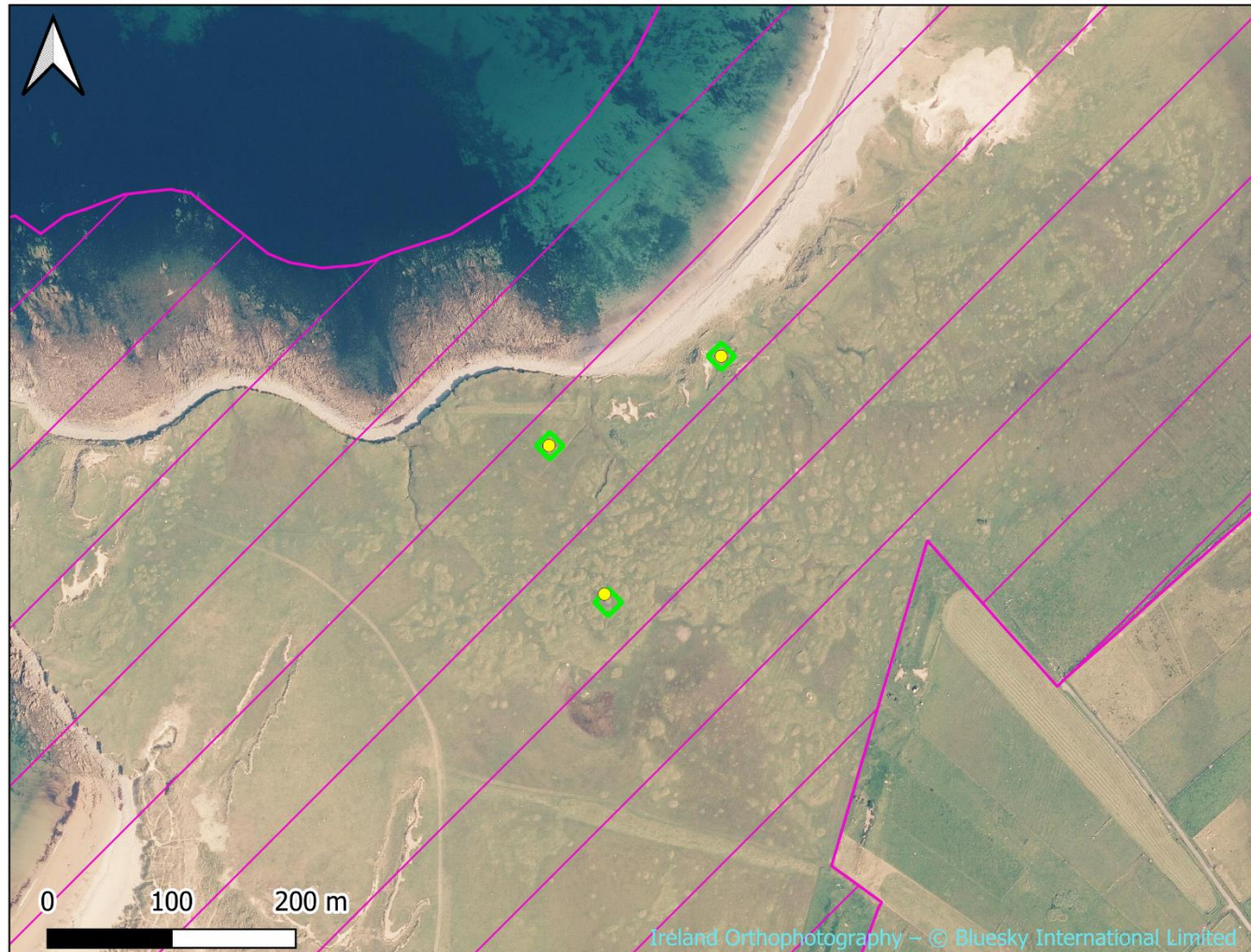
Conservation measure code	Conservation measure description
MA03	Maintain grazing regime as is



Figure 1 Machair plain at Doogort, where *Petalophyllum ralfsii* has been previously found.



Figure 2 Sandy flushes close to the sea, containing suitable habitat for *Petalophyllum ralfsii* at Doogort.



Legend:	
●	Previous records
◆	Suitable habitat noted in 2023
	Doogort Machair/Lough Doo SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr10 Doogort Machair	
Surveyor Initials:	
RHEK NL	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4; 1:5,000
Drawn by: KMN	Date: 15/10/2024

IWM 156 (2024) *Petalophyllum ralfsii* monitoring and assessment

Site name	Murvey Machair	Site number	PR15
County	Galway	SAC site code	0002129
Dates surveyed	04/05/2023	Surveyors	RH EK
Area of occupancy (m²)	1199	Estimated number of thalli	51562
No. of monitoring stops	4		
Site description			
<p>A broad machair area occurs on a coastal slope, with extensive areas of erosion around the lower western and northern parts of the machair, resulting in much windblown sand across the adjacent machair. Rock outcrops occur across the machair, interspersed with flushes, in some of which tufa is forming. An extensive population of <i>P. ralfsii</i> occurs in the lower, central area of the machair, with thousands of thalli likely present alongside rocks and flushes where regular deposition of windblown sand from adjacent erosion areas occurs. One sporophyte was observed. <i>P. ralfsii</i> occurs more sparingly to the south, on damp ground around the base of rock outcrops alongside wet flushes. Part of the area where <i>P. ralfsii</i> was mapped as occurring during the previous survey was not visited, but it is likely to be unchanged.</p>			
Changes from baseline			
<p>This site has not changed significantly since the visit of Campbell <i>et al.</i> in the previous monitoring period. Erosion of the adjacent machair may have led to the loss of some suitable habitat, but is also maintaining the suitability of the habitat for <i>P. ralfsii</i>, by spreading wind-blown sand, so is overall a positive impact.</p>			
Management notes			
<p>Heavy sheep grazing occurs and numerous rabbits and hares were observed. This grazing is beneficial for <i>P. ralfsii</i> but detrimental to the site as a whole. Coastal erosion, exacerbated by climate change and overgrazing, has led to a reduction in size of the machair habitat, but is also maintain areas of suitable habitat for <i>P. ralfsii</i>. Recreational use by walkers and quad bikes is apparent, but at low intensity. This site is being managed by the Life on Machair project, with the aim of halting coastal erosion and improving habitat quality.</p>			
Management recommendations			
<p>All erosion management that takes place should be carried out with sensitivity to the populations of <i>P. ralfsii</i> present. To keep the habitat in optimal condition for <i>P. ralfsii</i>, grazing levels should be retained as is.</p>			
Other notable species			
<i>Amblyodon dealbatus</i> , <i>Moerckia flotoviana</i>			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA08 Sheep grazing	+	H	100
PJ08 Coastal erosion	+	H	70
PM07 Rabbit/hare grazing	+	M	100
PF05 Walking	+	L	50
PA25 Offroad driving	+	M	5

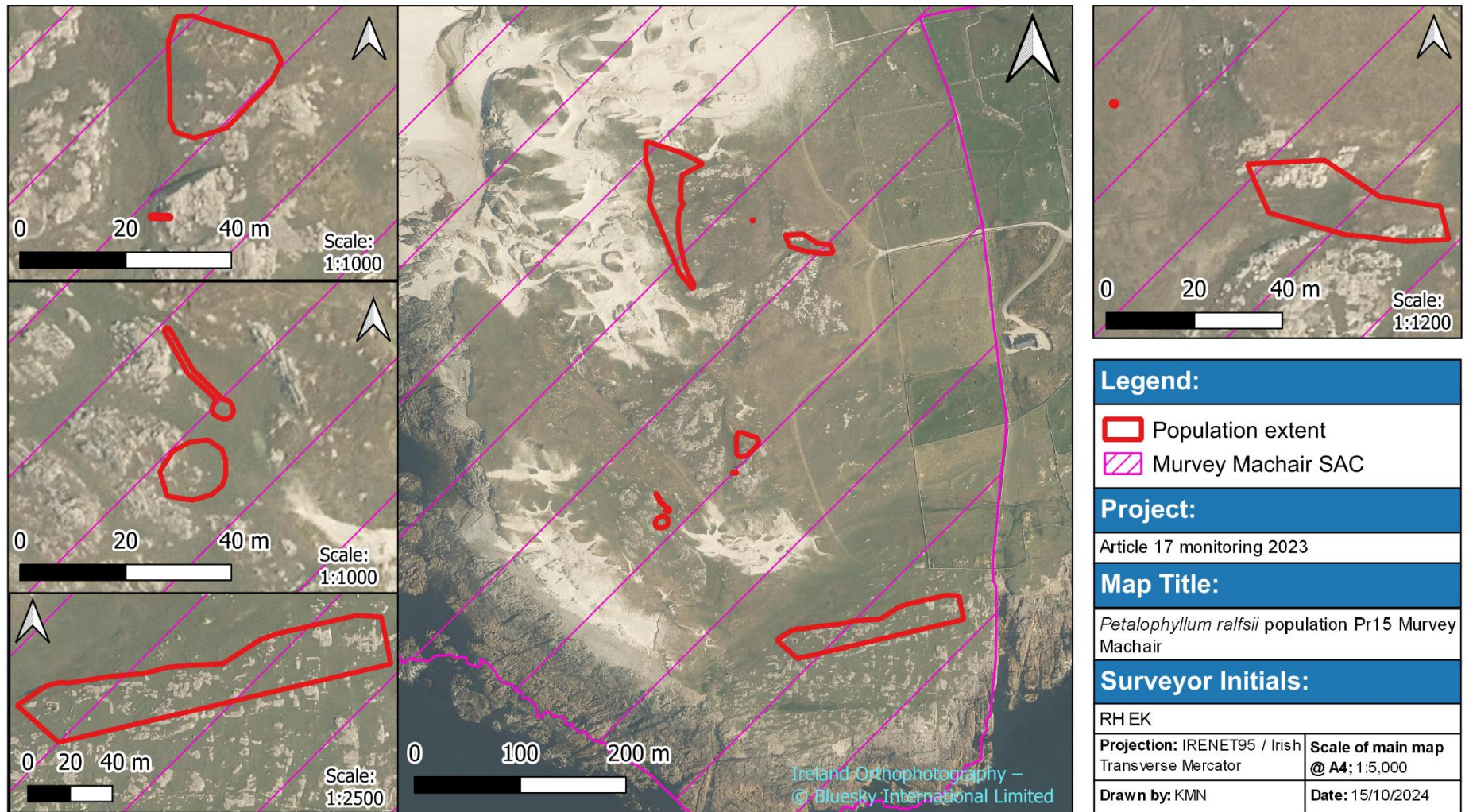
Conservation measure code	Conservation measure description
MJ01	Control coastal erosion exacerbated by climate change
MA03	Maintain grazing regime as is



Figure 1 Machair at Murvey, which supports a large population of *Petalophyllum ralfsii*.



Figure 2 Habitat of *Petalophyllum ralfsii* at Murvey, with location of individual thalli marked by sticks.



Site name	SW of L. Naparka	Site number	PR17a
County	Kerry	SAC site code	0002070
Dates surveyed	19/05/2023	Surveyors	RH
Area of occupancy (m²)	0	Estimated number of thalli	0
No. of monitoring stops	0		
Site description			
<p>This is a small dune slack in an extensive dune system in the middle of the Maharees peninsula. The majority of the slack is flooded for most of the winter, with a narrow band of gently sloping damp ground between the slack floor and the dry dune. This band is used as a path by cattle and people and is much trampled. Very little suitable habitat for <i>P. ralfsii</i> occurs, the majority of the habitat present in the narrow zone where the hydrology is suitable is either densely vegetated, with no open ground, or heavily poached, eutrophied and loose. Very small patches of compacted open ground occur, but are only marginally suitable for <i>P. ralfsii</i>.</p>			
Changes from baseline			
<p>This site is unchanged from previous descriptions from surveys in 2018, 2006 and 2003, none of which relocated the original 1998 record. These surveys all indicated that the habitat was unsuitable for <i>P. ralfsii</i>, due to the grazing regime being inappropriate, a situation that is still apparent.</p>			
Management notes			
<p>The site is grazed by cattle, with c 15 cattle observed within the slack, leading to trampling and eutrophication in the zone within which <i>P. ralfsii</i> was previously recorded. Recreational users of the dunes would also walk through the slack from time to time.</p>			
Management recommendations			
<p>The grazing regime should be changed from cattle to sheep, which would increase the suitability of the site for <i>P. ralfsii</i> and may lead to its re-emergence.</p>			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA07 Cattle grazing	-	H	100
PM07 Rabbit grazing	+	M	100
PF05 Trampling by walkers	+	M	80

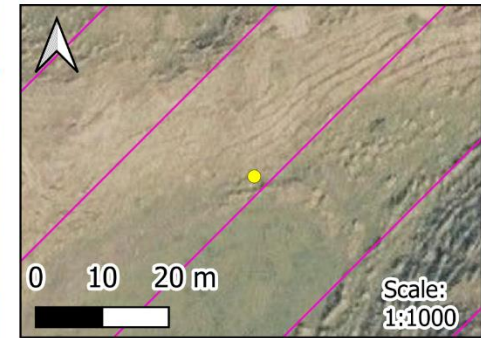
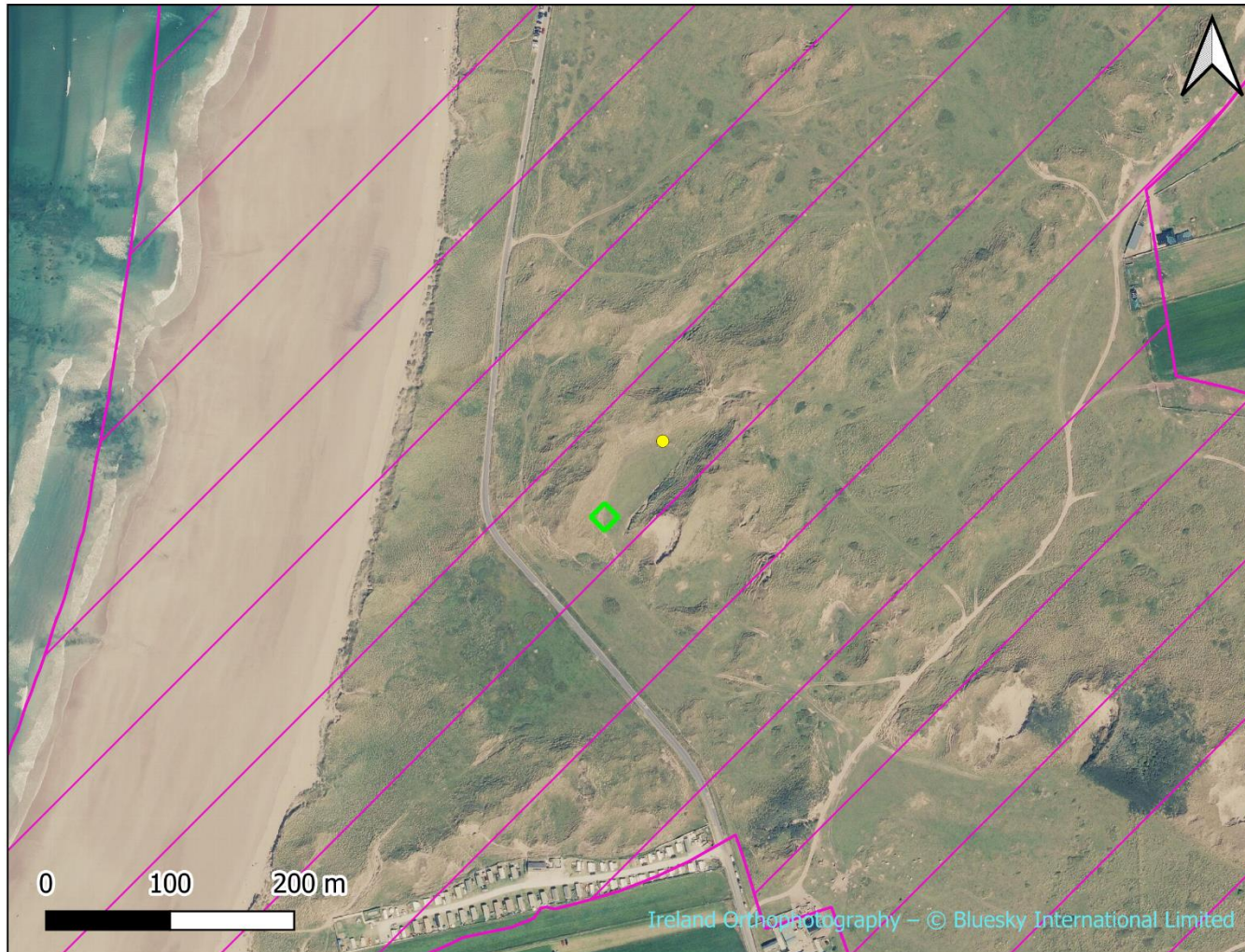
Conservation measure code	Conservation measure description
MA05	Change grazing regime from cattle to sheep and reduce grazing intensity and nutrient input



Figure 1 Slack within which *Petalophyllum ralfsii* was previously recorded, with grazing cattle.



Figure 2 Location where *Petalophyllum ralfsii* was previously recorded, now dominated by dense grass.



Legend:	
●	Previous records
◆	Suitable habitat noted in 2023
	Tralee Bay And Magharees Peninsula, West To Cloghane SAC

Project:
Article 17 monitoring 2023

Map Title:
<i>Petalophyllum ralfsii</i> population Pr17a SW of Lough Naparka (none recorded in 2023)

Surveyor Initials:
RH

Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

IWM 156 (2024) *Petalophyllum ralfsii* monitoring and assessment

Site name	Kilshannig	Site number	PR17c
County	Kerry	SAC site code	0002070
Dates surveyed	19/05/2023	Surveyors	RH
Area of occupancy (m²)	0	Estimated number of thalli	0
No. of monitoring stops	0		
Site description			
This is a broad, relatively open dune slack, with a seasonally inundated floor, which transitions to dry dune via a damp margin. The entire slack and the surrounding area is heavily grazed and poached, alongside widespread eutrophication, with feeding occurring nearby and fencing which would lead the cattle into the slack. Most of the slack is unsuitable for <i>P. ralfsii</i> , except for small patches a few centimetres across at the edge of the slack. <i>P. ralfsii</i> was not refound.			
Changes from baseline			
This site is generally in similar condition to that recorded during the previous survey of 2018, with the intensity and impact of trampling by cattle possibly having a greater impact than previously, as nearby dunes are more heavily eroded and impacted than when previously observed, suggesting that the intensity of the impact has increased.			
Management notes			
The site is heavily grazed by cattle, with widespread trampling and eutrophication apparent, making the habitat unsuitable in the main for <i>P. ralfsii</i> . A vehicle has also been driven through the slack in places, leading to deep rutting.			
Management recommendations			
The grazing regime should be changed from cattle to sheep, which would increase the suitability of the site for <i>P. ralfsii</i> and may lead to its re-emergence. The habitat may already be too heavily damaged for the survival of <i>P. ralfsii</i> .			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA07 Cattle grazing	-	H	100
PM07 Rabbit grazing	+	M	100
PA25 Offroad driving	+	M	5

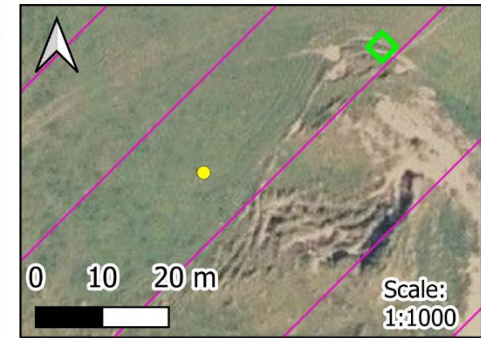
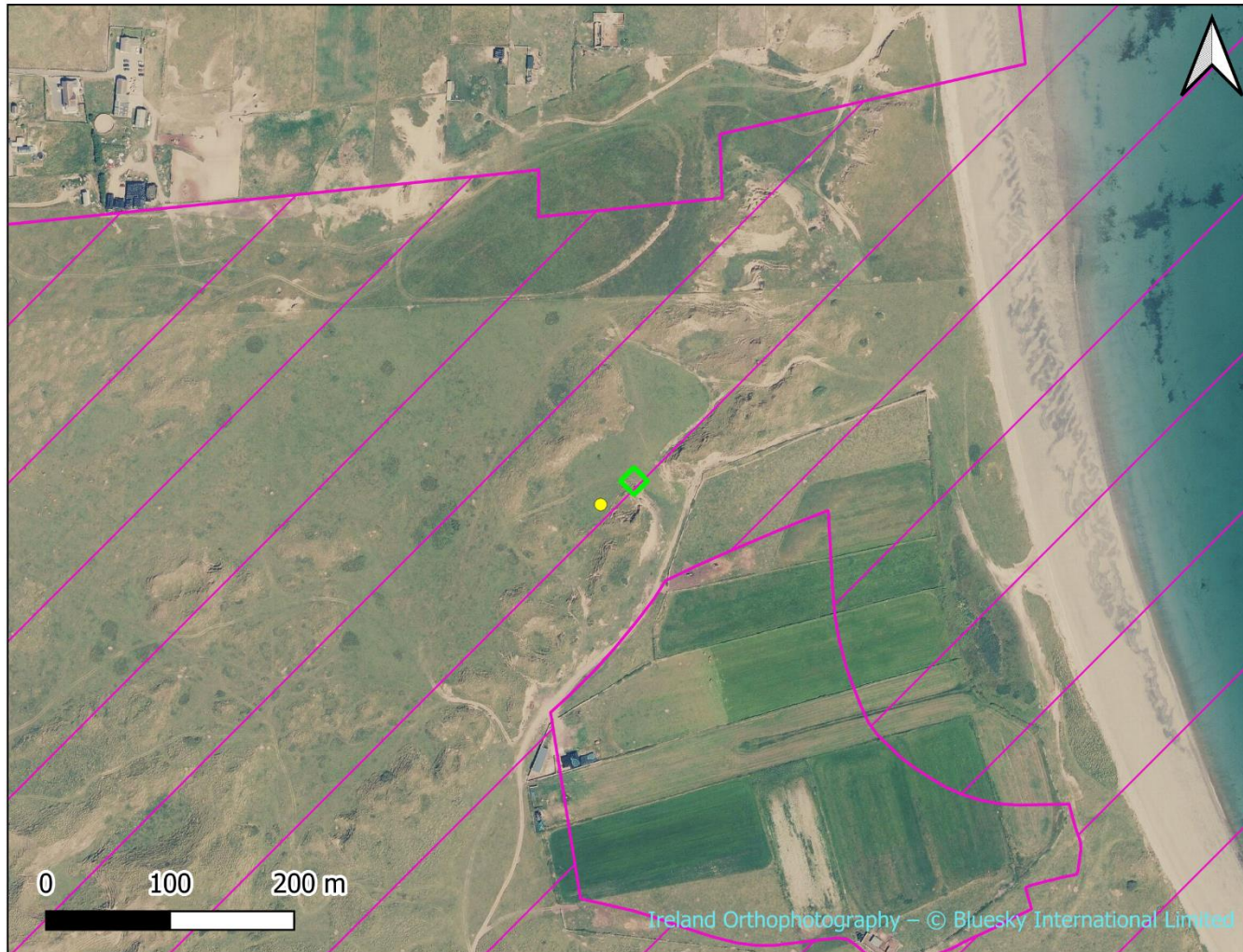
Conservation measure code	Conservation measure description
MA05	Change grazing regime from cattle to sheep and reduce grazing intensity and nutrient input



Figure 1 Dune slack at Kilshannig, showing heavy trampling by cattle.



Figure 2 Area in dune slack at Kilshannig with very small patches of ground that are marginally suitable for *Petalophyllum ralfsii*.



Legend:	
●	Previous records
◆	Suitable habitat noted in 2023
	Tralee Bay And Magharees Peninsula, West To Cloghane SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr17c Kilshannig (none recorded in 2023)	
Surveyor Initials:	
RH	
Projection: IREN95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

Site name	Rosbehy	Site number	PR18b
County	Kerry	SAC site code	0002074
Dates surveyed	15/05/2023	Surveyors	RH
Area of occupancy (m²)	0	Estimated number of thalli	0
No. of monitoring stops	0		
Site description			
<p>Rosbehy is a narrow sand spit stretching north from the Iveragh Peninsula, near Glenbeigh. The majority of the spit is rolling dry sandhills, with a saltmarsh area to the rear. The northern end of the spit has been severely eroded in the past decades by winter storms. Small damp slacks occur towards the southern end of the spit. No suitable ground for <i>P. ralfsii</i> occurs in these slacks, apart from in the slack in which <i>P. ralfsii</i> was previously found. This slack is bisected by a broad stony track running across the spit, flanked by rutted vehicle tracks running through the vegetation and merges into saltmarsh at the rear of the spit. A short band of compacted ground along the southern side of the stony track appears suitable for <i>P. ralfsii</i>, along a length of c 95 m. The most suitable area is in the centre of this stretch and covers an area of c 25 m x 60 cm along the side of the stony track, where cars are sometimes parked, leading to compaction. Species present in this habitat include <i>Carex panicea</i>, <i>Bellis perennis</i>, <i>Trifolium repens</i>, <i>Juncus acutiflorus</i>, <i>Amblystegium serpens</i>, <i>Pohlia wahlenbergii</i>, <i>Calliergonella cuspidata</i>, <i>Pellia</i> species, <i>Didymodon insulanus</i>, <i>Didymodon fallax</i> and <i>Cratoneuron filicinum</i>. <i>P. ralfsii</i> was not observed but may still be present. The area to the north of the track showed little suitability, with a dense, closed, sward.</p>			
Changes from baseline			
<p>The location of the first record by Holyoak in 2006, to the north of the stony track, shows little suitability at present, and may have closed over since that time. The area where Lockhart recorded thalli in 2012, just to the south of the track, still seems suitable and is little changes since then, although <i>P. ralfsii</i> was not found in this occasion.</p>			
Management notes			
<p>This area is heavily used for recreation purposes, and is adjacent to the parking area for the beach. When the beach is busy, it is likely that cars would be parked off road on the areas where <i>P. ralfsii</i> occurs. Tractors have also been driven to the side of the track, leading to the creation of deep wheel ruts in the slack vegetation. The area would also be trampled by walkers.</p>			
Management recommendations			
<p>It should be ensured that Kerry County Council are aware of the presence of <i>P. ralfsii</i> and it is not eliminated by expansion of the parking facilities or widening of the track</p>			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PF04 Offroad driving and parking	+	M	100
PF05 Trampling by walkers	+	M	100
PM07 Rabbit grazing	+	M	100

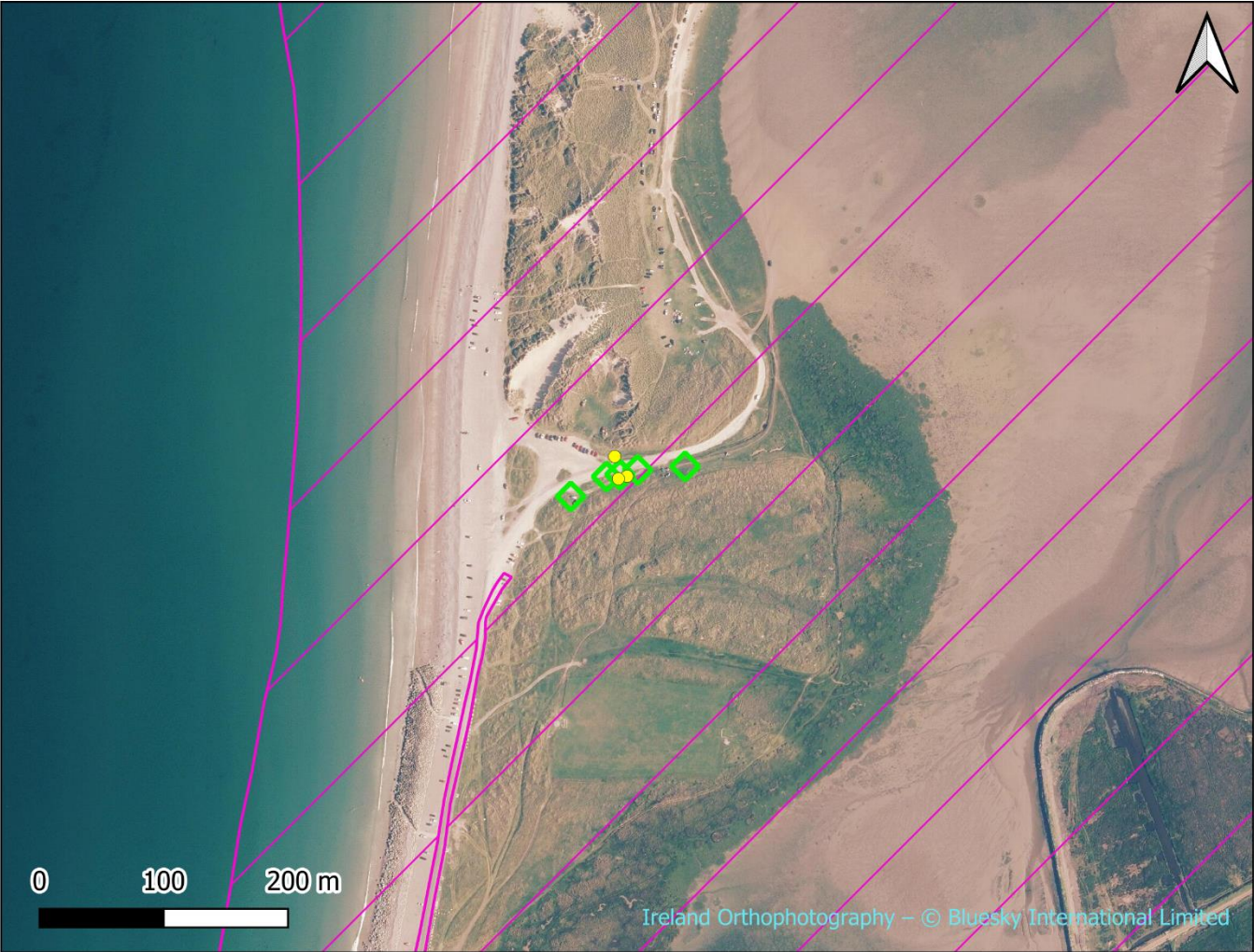
Conservation measure code	Conservation measure description
MF10	Make council aware of presence of the species, so that habitat is not inadvertently destroyed



Figure 1 Damp slack at Rosbehy, bisected by a track and much disturbed by vehicles.



Figure 2 Narrow band of suitable habitat for *Petalophyllum ralfsii* alongside track at Rosbehy.



Legend:	
	Suitable habitat noted in 2023
	Previous records
	Castlemaine Harbour SAC
Project:	
Article 17 monitoring 2023	
Map Title:	
<i>Petalophyllum ralfsii</i> population Pr18b Rosbehy	
Surveyor Initials:	
RH	
Projection: IRENET95 / Irish Transverse Mercator	Scale of main map @ A4: 1:5,000
Drawn by: KMN	Date: 10/10/2024

IWM 156 (2024) *Petalophyllum ralfsii* monitoring and assessment

Site name	West of Inny Ferry	Site number	PR19
County	Kerry	SAC site code	0000335
Dates surveyed	29/01/2024	Surveyors	RH
Area of occupancy (m²)	0	Estimated number of thalli	0
No. of monitoring stops	0		
Site description			
<p>This site consists of a relatively flat sandy grassland, behind a long curving beach and sloping down to a wetland area, dominated by <i>Phragmites australis</i>. This area is grazed mainly by cattle, and is fenced into a number of compartments. There are low dunes at the western end of this area, with the eastern end consisting of semi-improved agricultural grassland. <i>P. ralfsii</i> was recorded by N. Lockhart in 1998 on steep sandy banks sloping down to a wetland area, towards the eastern end of the site, which is likely to be where it was originally recorded by Scully in 1890. It has not been recorded here since, despite multiple searches. The area of the previous record was carefully searched, but only tiny areas of marginally suitable habitat, a few centimetres across were found and no thalli of <i>P. ralfsii</i> were located.</p>			
Changes from baseline			
<p>This site has changed little since it was visited during the last monitoring period, with no significant suitable habitat present. As then, the sward is dense and closed, with little bare ground, and cannot currently be considered to be suitable for <i>P. ralfsii</i>.</p>			
Management notes			
<p>Extensive cattle grazing occurs across this site at moderate levels, at lower intensity than described by Lockhart in 1998 and similar to those observed during the previous monitoring period. The current grazing regime is not suitable for the growth of <i>P. ralfsii</i>.</p>			
Management recommendations			
<p>If the grazing regime were changed, <i>P. ralfsii</i> may reappear where it was previously recorded. Sheep grazing would create more favourable conditions for its growth, with a more open, lower sward and a higher proportion of open ground.</p>			
Other notable species			
None			

Impact Code/Description	Influence	Intensity	% Habitat impacted
PA08 Extensive cattle grazing	0	M	100
PM07 Succession to rank vegetation	-	M	100

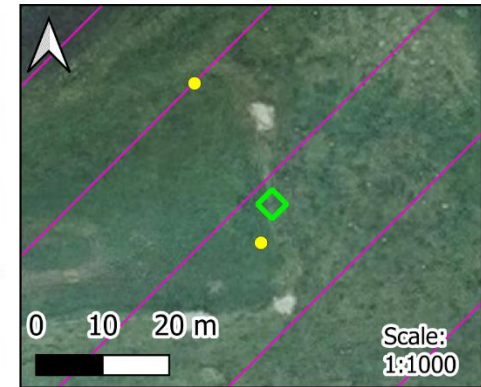
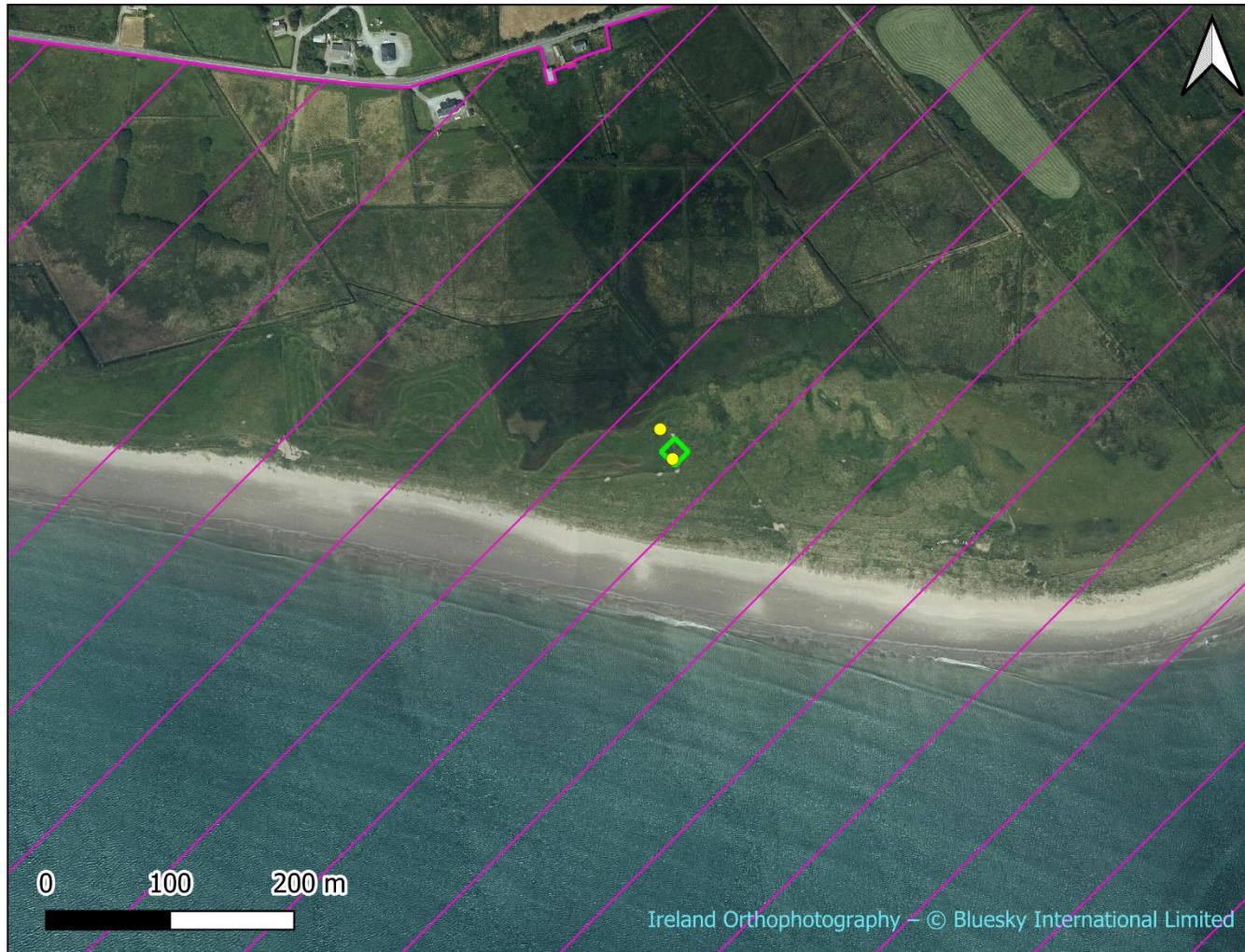
Conservation measure code	Conservation measure description
MA05	Change grazing regime from cattle to sheep



Figure 1 Sandy bank West of Inny Ferry, where *Petalophyllum ralfsii* was previously recorded.



Figure 2 Close up of habitat West of Inny Ferry, with very small patches that are marginally suitable for *Petalophyllum ralfsii*.



Legend:

- Previous records
- ◇ Suitable habitat noted in 2023
- ▨ Ballinskelligs Bay and Inny Estuary SAC

Project:

Article 17 monitoring 2023

Map Title:

Petalophyllum ralfsii population Pr19 West of Inny Ferry

Surveyor Initials:

RH

Projection: IREN95 / Irish Transverse Mercator **Scale of main map @ A4:** 1:5,000

Drawn by: KMN **Date:** 10/10/2024

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