Survey of rare charophytes

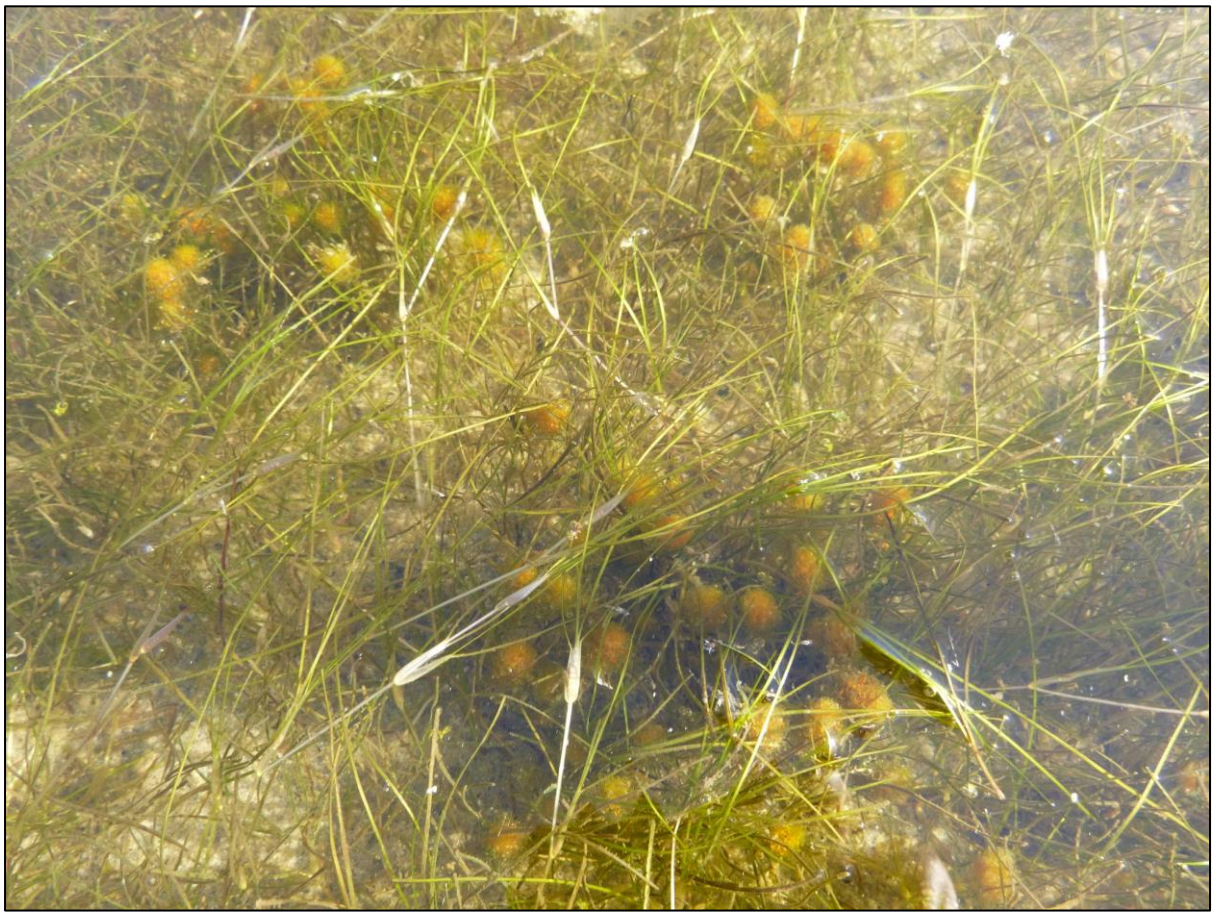
Foxtail Stonewort *Lamprothamnium papulosum*

and

Bearded Stonewort *Chara canescens*

at **Lady's Island Lake Lagoon, Co. Wexford**

in **August** and **September 2025**



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An tSeirbhís Páirceanna Náisiúnta agus Fiadhúlra
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Cover photo: Foxtail Stonewort *Lamprothamnium papulosum* at Lady's Island Lake in 2018. Mike Wyse Jackson, NPWS.

The NPWS project officer for this contract was Áine O Connor, Scientific Advice and Research Directorate

Contents

Introduction

Lamprothamnium papulosum is an obligate brackish-water species that was first recorded in Ireland in 1973, from Lady's Island Lake and a second site in County Clare (Moore *et al*., 1975). It is listed on the Flora (Protection) Order 2022 (S.I. No 235). It is known from approximately 17 Irish sites in counties Clare, Wexford, Galway and Donegal. Records for the species at Lady's Island Lake are widespread across the lagoon (see Figure 1 and Appendix 1), and it was most recently seen there in 2024 by Paul Green and others. The optimum mean annual salinity for growth and reproductive effort for *Lamprothamnium papulosum* is higher than for most charophytes reaching 23 to 25 psu in Britain and Ireland (Martin, 2001; Rodrigo *et al*., 2024).

Chara canescens was the first brackish-water charophyte recorded in Ireland (in 1894), but was not recorded from Lady's Island Lake until 1973 (Moore *et al*., 1975). It is known from 14 Irish sites in counties Kerry, Clare, Wexford, Galway, Sligo, Donegal and Derry. Records for the species are also widespread at Lady's Island Lake (Figure 2 and Appendix 1) and it was last recorded there in 2010. *Chara canescens* is known to have lower optimal salinity levels (below 20 psu) than *Lamprothamnium papulosum* (Schubert *et al*., 2024).

Both species are threatened at their Lady's Island Lake stations as this lagoon[1] has been shown to be severely eutrophicated and has suffered the almost complete destruction of its benthic vegetation (O'Connor *et al*., 2024). This contrasts with the lagoon's state in the 1970s when the phytobenthos was well-developed (Healy *et al*., 1982). Bates (1977) reported that in water less than 1.5 m, *Ruppia* spp. was the dominant macrophyte with cover values of 15-90%. Below 1.5 m isolated plants occurred. He noted large masses of drift *Ruppia* in autumn along the shoreline. Large blooms of *Enteromorpha* were also noted at this time, as well as *Cladophora* sp. and *Ulva* sp. Phytoplankton was dominated by the marine diatom *Skeletonema costatum*, unlike the present domination by cyanobacterial picoplankton. Appendix 1, which lists all known records of all charophyte species in Lady's Island Lake, shows both species have been known from 1973 onwards. Two other charophyte species have also been recorded, *Chara aspera* and *Tolypella glomerata*, but the former was last seen in 2003 and the latter in 2005.

To date no systematic survey of the lagoon's charophyte flora has been undertaken but as new controls of lake levels are under discussion, it is important to record charophyte distribution and relate distribution to salinity. This is the purpose of the present survey. Interpretation of the survey results is greatly facilitated by the extensive data set assembled during the recent CLEAR project (O'Connor *et al*., 2024).

[1] Lady's Island Lake is a Coastal lagoon. The terms 'lake' and 'lagoon' are used interchangeably in this report and at all times refer to brackish water.

Methods

Preparatory work

Permission was obtained from NPWS regional staff to visit the island sites of nesting terns during September. A Wildlife Act Section 21 licence to collect specimens of the Flora (Protection) Order species *Lamprothamnium papulosum* was also obtained (Licence No. FL12/2025).

Field Survey

Two types of survey were undertaken: a shore survey to locate shallow-water shoreline populations; and a boat survey to find deep water populations.

1. Walking survey of all shorelines. The shoreline survey was conducted in August and September, wading in shallow water and using grapnels to sample adjacent deeper water. The following factors were recorded
    a. Species present (*Lamprothamnium papulosum* and *Chara canescens*)
    b. Population size (counting individual plants where less abundant, estimating population size where abundant)
    c. Presence of vascular plants
    d. Exact positions of samples determined by GPS.
    e. Salinity (see below)

    Island shorelines were accessed by boat

2. Boat Survey. 23 points were sampled throughout the lake (see Figure 3):
    a. Position was determined by GPS
    b. Depth was recorded using a weighted line
    c. Secchi depth was recorded using a standard black and white disk
    d. Temperature was recorded using a digital thermometer and
    e. Salinity (accurate to +/-1.0 psu) measured by refractometer
    f. Bottom vegetation was determined using a grapnel

    As the lake was very turbid, neither snorkelling nor underwater photography could be used. Very windy weather on 15 and 17 September confined boat use to 16 September 2025, but it was possible to survey the entire lake on this day.

Report preparation

All species records were entered on Excel spreadsheets. Earlier data from the CLEAR project and previous lagoon surveys available to the authors were used in report preparation.

Results

Current and previous distribution of charophyte species

Lamprothamnium papulosum

Figure 1a shows the distribution of *Lamprothamnium papulosum* in Lady's Island Lake in August and September 2025. Appendix 2 gives precise details of the 2025 records. All but one record of the species occurs along the shore in depths less than 50 cm, with most records in less than 10 cm. One record was made east of Our Lady's Island at a depth of 1.2 m. The plant occurs along most of the shoreline with the exception of parts of the south and east shore. In places it is extremely abundant but elsewhere it is less abundant and scattered amongst dense stands of *Ruppia* spp. Associates included *Ruppia maritima*, *R. spiralis* and *Stuckenia pectinata*.

The species was first recorded in 1973 and has been recorded on at least ten occasions since then (see Appendix 1). Figure 1b shows the location of historic records, all of which are along the shore. However Healy *et al*. (1982) seem to imply *Lamprothamnium papulosum* also occurred at depth in 1978.

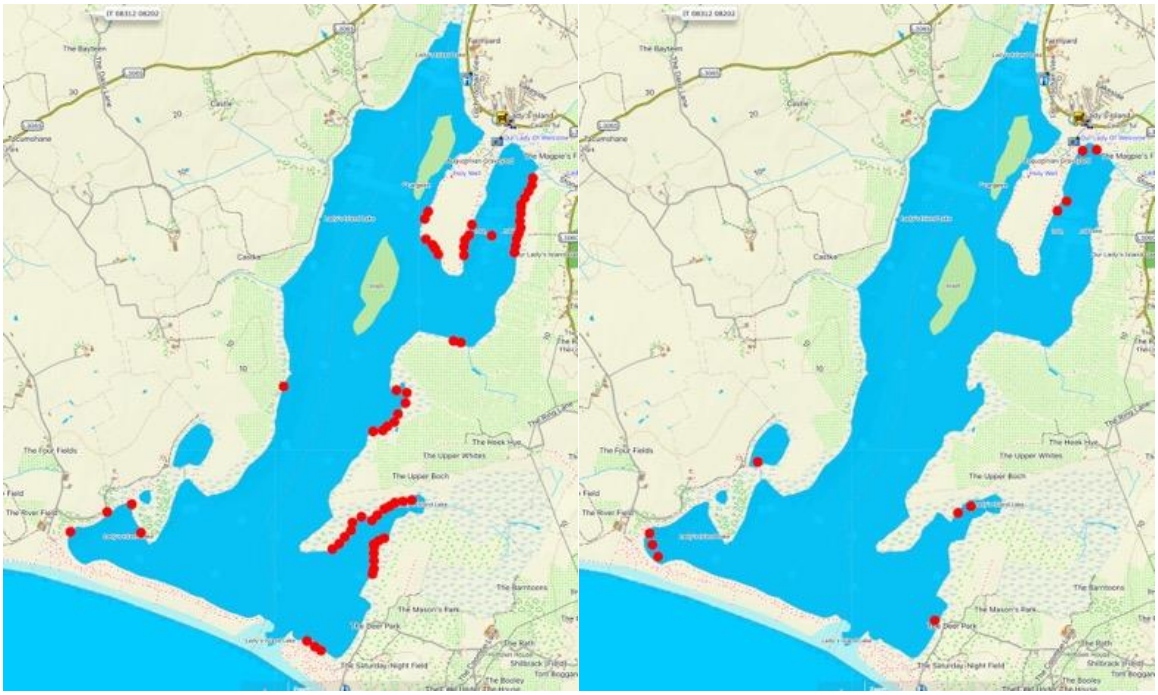

Figure 1. The distribution of *Lamprothamnium papulosum* in 2025 (1a, left) and records for the species made prior to 2025 (1b, right). Red dots show approximate locations. Consult Appendix 1 and Appendix 2 for precise locations.

Chara canescens

Figure 2a shows the distribution of *Chara canescens* in 2025. Appendix 3 gives precise details of the 2025 records. It was confined to two areas along the shore in the east of the lake in 2025 and always accompanied by *Lamprothamnium papulosum* but rarely with other species such as *Ruppia* spp. or *Stuckenia pectinata*. The species is known to prefer less saline water than *Lamprothamnium papulosum*

and its limited distribution in Lady's Island Lake seems to be related to known areas of lower salinity and proximity to freshwater inflows.

Figure 2b shows the locations of previous records of *Chara canescens* (see also Appendix 1). Its historic distribution was restricted with colonies in the north-east, south-east and two semi isolated pools in the south-west. But as noted above for *Lamprothamnium papulosum*, the species may have been more widespread in the 1970s. We have no information about the exact location of the original 1973 record.

Figure 2. The distribution of *Chara canescens* in 2025 (2a, left) and records for the species made prior to 2025 (2b, right). Red dots show approximate locations. Consult Appendix 1 and Appendix 2 for precise locations.

An unusual alga: *Cladophora battersii*

Cladophora battersii is a distinctive unattached species of *Cladophora* found in a number of Irish lagoons, but not previously recorded from Lady's Island Lake. It is probably a lagoonal specialist. It was thought to be extremely rare before further stations were found during the lagoon surveys of the 1990s. It was seen entangled in *Ruppia* stems at several stations during the present survey.

The Lady's Island Lake environment in 2025

The distribution of surface temperature and salinity on September 16 2025 is shown in Figure 3. There is very little difference in water temperature across the lagoon, with slightly warmer water at the northern end. The salinity map shows slight variation at the southern end (possibly reflecting the accuracy of hand held refractometer readings) but large differences in the north-eastern arm where the single largest stream discharges into the lake. The brackish nature of the lake is confirmed by the 14 psu salinity across most of the lake, as well as demonstrating a

well-mixed water body. The slightly higher reading of 15 psu north of the breaching site may indicate sea water entry.

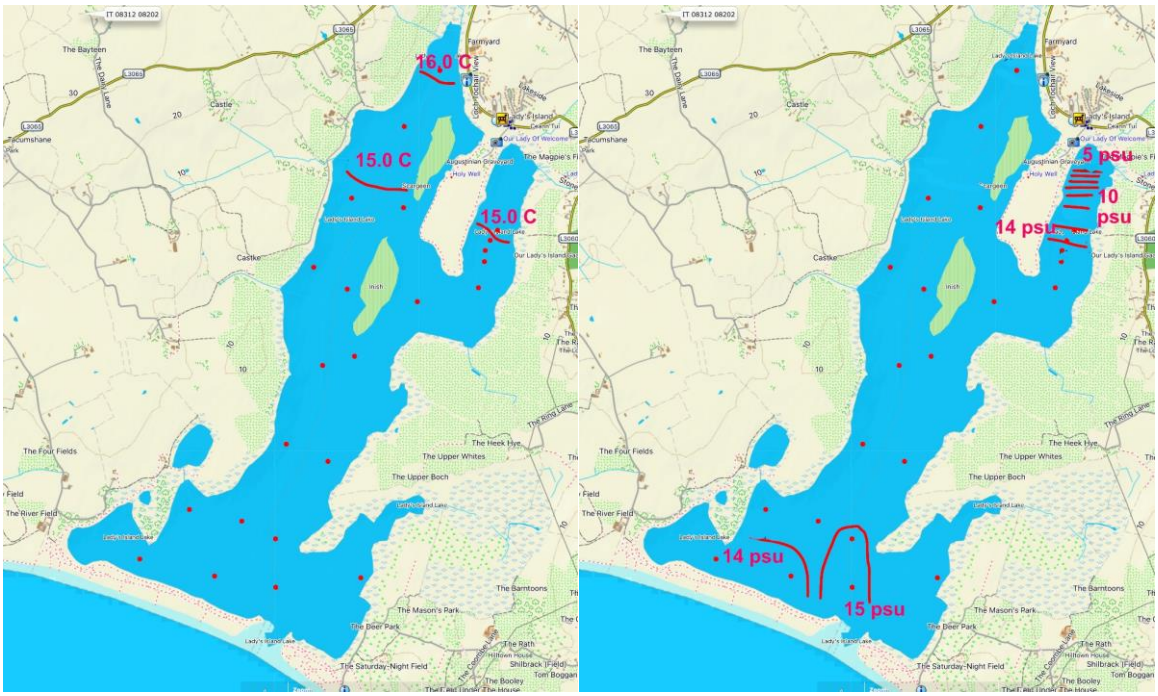

Figure 3. Surface water temperature in Lady's Island Lake on 16/09/2025 (3a, left) and surface salinity (3b, right). Red dots show points sampled.

The benthic vegetation of the lake

The lake water was very turbid and green due to plankton blooms. Maximum Secchi depths of 0.5-0.6 m were recorded.

The lake bottom supports three zones with two vegetation types (Figure 4):

1) A bare sediment area extending south-southwest to north-northeast over the entire lake. No plant material was found in this area. Water depth varied from 1.2-2.0 m.

2) Between the bare sediment area and shore of much of the lake, samples with *Ruppia* spp. were taken. It is not possible to quantify vegetation cover from grapnel samples but dense swards were not found (see Plates 1 and 2). Other species included *Cladophora* sp., *Ulva intestinalis* and at one sampling point *Lamprothamnium papulosum* occurred. An additional record for Lady's Island flora was the probable lagoonal specialist alga *Cladophora battersii.*

3) Swards of *Stuckenia pectinata* were found in two areas in the north of the lake, with *Ruppia* present in some samples along with *Cladophora*. The majority of *Stuckenia pectinata* samples were taken in the area of lower salinity in the north-eastern arm. Freshwater also discharges at the northern-most point of the lake where *Stuckenia pectinata* was also found. Some *Stuckenia* also occurred along the shore in the south-east sector in an inlet where *Chara canescens* is also found.

The bathymetry of the lake (O'Connor *et al*., 2024) shows a close correspondence between the central bare area and areas of deeper water.

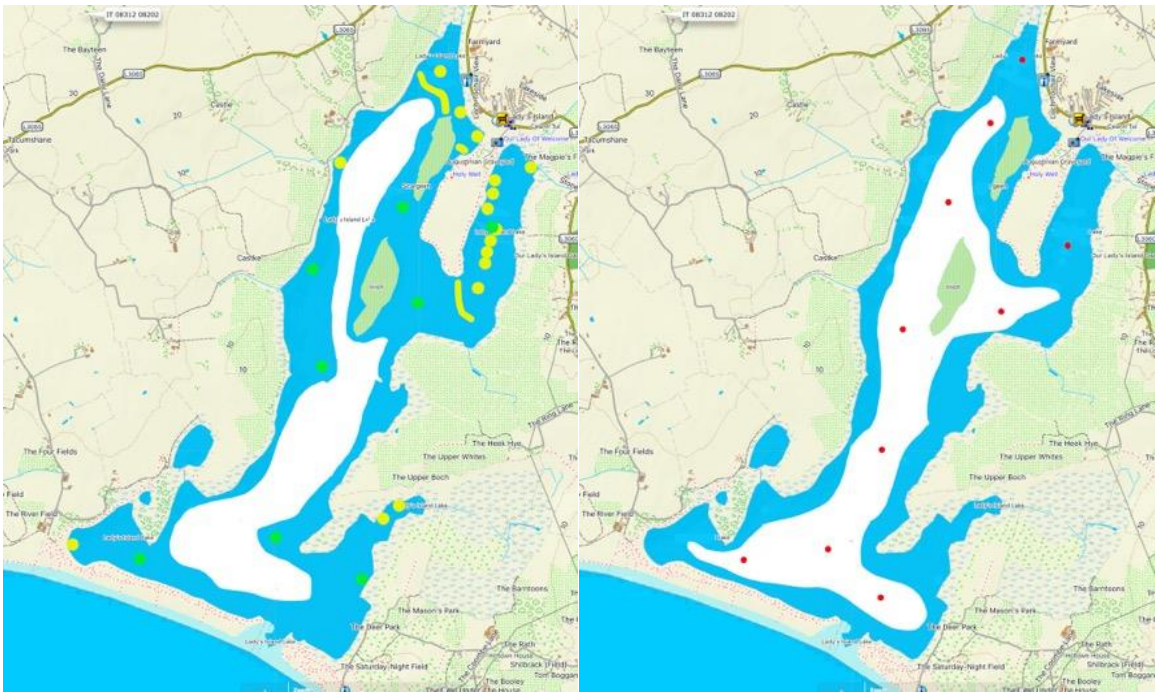

Figure 4. Benthic vegetation in 2025 (4a, left) and in 2019 (4b, right). See Figure 3 for all 2025 sampling points. Red dots in 4b show sampling points in 2019. White areas had no rooted vegetation. In 4a, green dots show presence of *Ruppia*, yellow shows presence of *Stuckenia pectinata*. Shore samples of *Stuckenia pectinata* are shown but *Ruppia* samples are omitted as the plants grew along the shore of the lake except around the barrier cut.

The shore line vegetation

Vegetation examined by walking the shore and grapnelling showed very dense swards of both *Ruppia* spp. (*Ruppia maritima* and *Ruppia spiralis*) around much of the shore (Plates 1 and 2). *Stuckenia pectinata* was also recorded along the shore of the north-eastern arm (Lady's Island shore) and on the south-eastern shore near the stations for *Chara canescens*. Very large floating or entangled masses of *Cladophora* sp. (including *Cladophora battersii*) occur at many points, entangled in rooted *Ruppia* spp. In the north-eastern arm floating masses of *Cladophora* were also noted.

Summary of lake vegetation in 2025

In summary, no rooted vegetation was found in water greater than 1.5-2.0 m. Above this depth, some *Ruppia* spp. grew but dense swards were confined to depths shallower than 50 cm, where the plants formed a 1-10 m wide sward around the lake shore (see Plates 1 and 2). *Stuckenia pectinata* was mainly found in the north-eastern arm, possibly because of the lower salinities recorded there. There was no obvious difference in the distribution of *Ruppia maritima* and *Ruppia spiralis*. Drift *Cladophora* sp., *Cladophora battersii* and *Ulva intestinalis* occurred throughout the lake. *Lamprothamnium papulosum* was very common in the shallow shore zone

where it grew either as monocultures or interspersed in *Ruppia* swards. Only one specimen of *Lamprothamnium papulosum* was collected in deeper water. *Chara canescens* was confined to two areas both of which also supported *Stuckenia pectinata*, possibly because *Chara canescens* prefers lower salinities (<10 psu) than *Lamprothamnium papulosum*.

Plate 1. Top (Plate 1a) *Ruppia* swards in 2025 at south-western corner (top left) and north-eastern arm (top right). Bottom (Plate 1b) corresponding photos taken in 2017 (bottom left) and 2012 (bottom right). Note absence of rooted vegetation and intense green colour of water.

Lake vegetation in earlier surveys

The distribution of both charophyte species in 2025 was apparently far more extensive than in previous years (Figures 1 and 2). Similarly the extent of vegetation was greater in 2025 than in earlier surveys (Plates 1 to 6). Figure 4b shows the extent of benthic vegetation in 2019 when the area of bare ground was larger than in 2025.

Plate 2. Top (Plate 2a) extensive *Ruppia* beds in 2025 at south-western corner. Bottom (Plate 2b) South-western corner in 2019, no dense sward but some *Ruppia* near boat's stern.

Roden (2004) summarised benthic vegetation of Lady's Island Lake in July 2003:

> "In contrast to the dense planktonic flora the benthic flora was extremely reduced compared to most Irish lagoons. At most stations only a few-if any- macrophytes were present. Any attempt to examine the benthos by snorkelling had to be abandoned as underwater visibility was non-existent, complete darkness obtained within 70 cm of the surface. No benthic macrophytes could be found, even by grapnel, in water more than 50 cm. It was also noted that black anoxic sediment was found within millimetres of the sediment surface.
>
> The lagoon was known in the past for a variety of rare aquatic plants but at present, few aquatic macrophytes can be found. Two red data book species, *Lamprothamniun papulosum* and *Chara canescens* were found in the south-eastern part of the lake in September in very shallow water (<10 cm) on sand. These plants were very small and may have germinated from spores since the summer fish kill in the lake. Two species of *Ruppia* and *Potamogeton pectinatus* [*Stuckenia pectinata*] were also found as scattered individuals or forming small colonies along the shore in 20-30 cm depth. However it is clear that no benthic macrophytes occur in water deeper than 50 cm or more than 90% of the lake bottom. As the lake is between 1 and 2 m over most of its depth it can be presumed that this area would be vegetated in the absence of the light blocking phytoplankton bloom."

Plate 3. South-western corner in 2012: high water level and no *Ruppia* sward.

Figure 5 (next page) reproduces a vegetation map made from 2003 data.

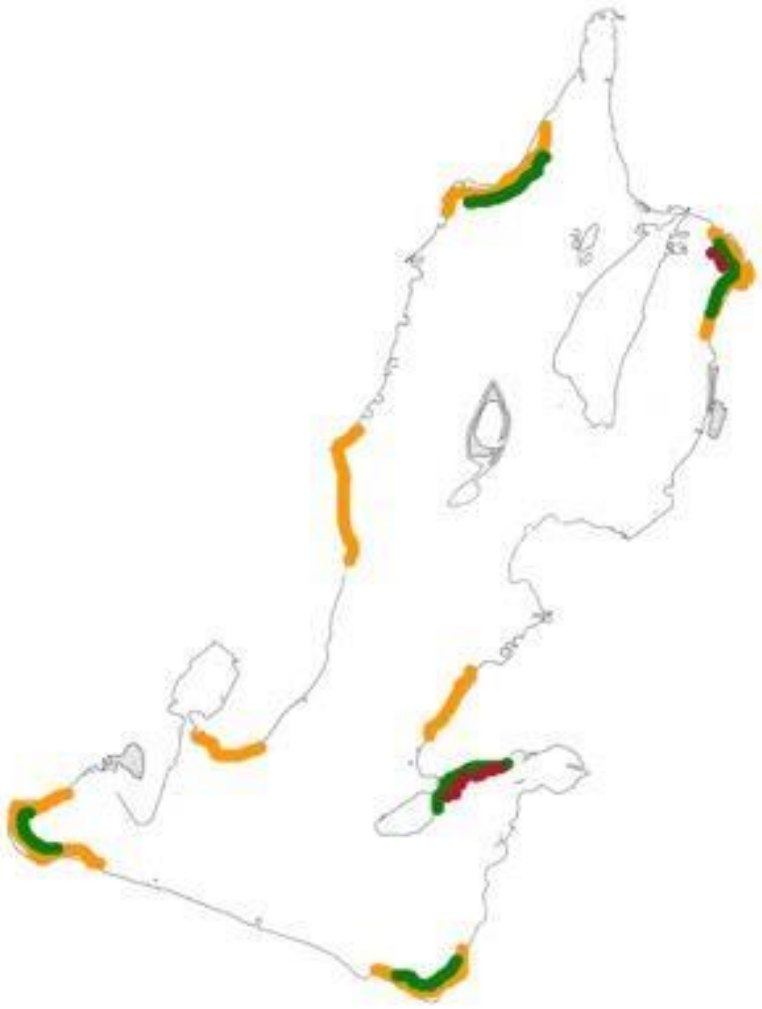

Figure 5. Benthic vegetation in 2003 (from Roden 2004). Red dots show charophyte locations, green indicates *Ruppia* spp., while orange corresponds to *Stuckenia pectinata*. Note the more widespread distribution of *Stuckenia pectinata* than in 2025, possibly reflecting less saline conditions (see Figure 8).

In 1996, P. Hatch recorded shore transects around the lake as part of the first national lagoon survey led by the late Dr Brenda Healy (Hatch, 1996; Healy *et al*., 1997; Healy, 1998). With the exception of the south-east corner, he recorded high cover of *Ruppia* spp. in a 5-20 m wide band all around the lake even at the head of the north-eastern arm. Surprisingly he did not record *Stuckenia pectinata* except in the isolated Bunargate pond in the south-west of the lagoon. Of note were the high salinities of 22-23 psu he recorded throughout the lagoon even in the north-eastern section.

In 1996, 2003 and 2017 vegetation relevés were taken in the south-west and north-east of the lake. These samples are shown in Appendix 4. Combining the results from the four surveys between 1996 and 2025, it appears that while species composition in the lake is constant, cover values vary greatly from extensive swards in 2025 and 1996 to isolated individual plants in 2003 and in the CLEAR survey of 2019-2020 (C. Roden personal observation).

Plate 4. North-eastern arm in 2012, floating *Cladophora*.

Plate 5. Southern shore in 2010, abundant *Cladophora* and some *Ruppia*.

Plate 6. South-western corner in 2003. No sward and massive algal bloom.

Discussion

Factors determining the growth of macrophytes in Lady's Island Lake.

Data collected during the recent CLEAR report (O'Connor *et al*., 2024) indicate that nutrient enrichment within the lake is driven by rainfall. This conclusion was based on data collected in 2019-20. The following summary diagrams (Figures 6, 7 and 8) confirm this conclusion by using all available data collected during surveys in 2009, 2010, 2011, 2012, 2016 and 2017, as well CLEAR data.

Figure 6 shows lake level is, unsurprisingly, partly determined by rainfall (obviously the timing of the barrier breach is another important factor). As the lake has no permanent outflow, increased rainfall results in higher water levels and lower salinity, as well as increased chlorophyll and Dissolved Inorganic Nitrogen (D.I.N.), due, it appears, to nutrient run-off from land. There is a strong correlation between lake level and D.I.N. with low lake levels associated with low nitrogen concentrations. Low water levels are also associated with high salinity (Figure 7).

Combining these relationships, it appears that when rainfall and lake level are low there is little nutrient inputs from the catchment and, as a result, less planktonic algae (measured as chlorophyll) in the lagoon. Consequently, light availability to benthic plants increases, both because of shallower water depths and less chlorophyll. In most summers, water loss through evaporation exceeds rainfall and lake level falls. The magnitude of the lake level fall is thus an indicator of favourable benthic macrophyte growth. As both rainfall data and lake levels are available for Lady's Island Lake, one can distinguish favourable from unfavourable years for benthic plant growth.

Figure 8 plots lake level fall against summer rainfall for Lady's Island Lake. The plot shows that larger declines in lake level are associated with drier summers. The summer of 2025 was unusually dry, as was the summer of 1996. In both years very extensive swards of *Ruppia* spp. were recorded, conversely large swards were not encountered in, 2003, 2012, 2017 or 2020. These data may indicate that benthic vegetation development fluctuates in Lady's Island Lake, rather than being in continuous decline.

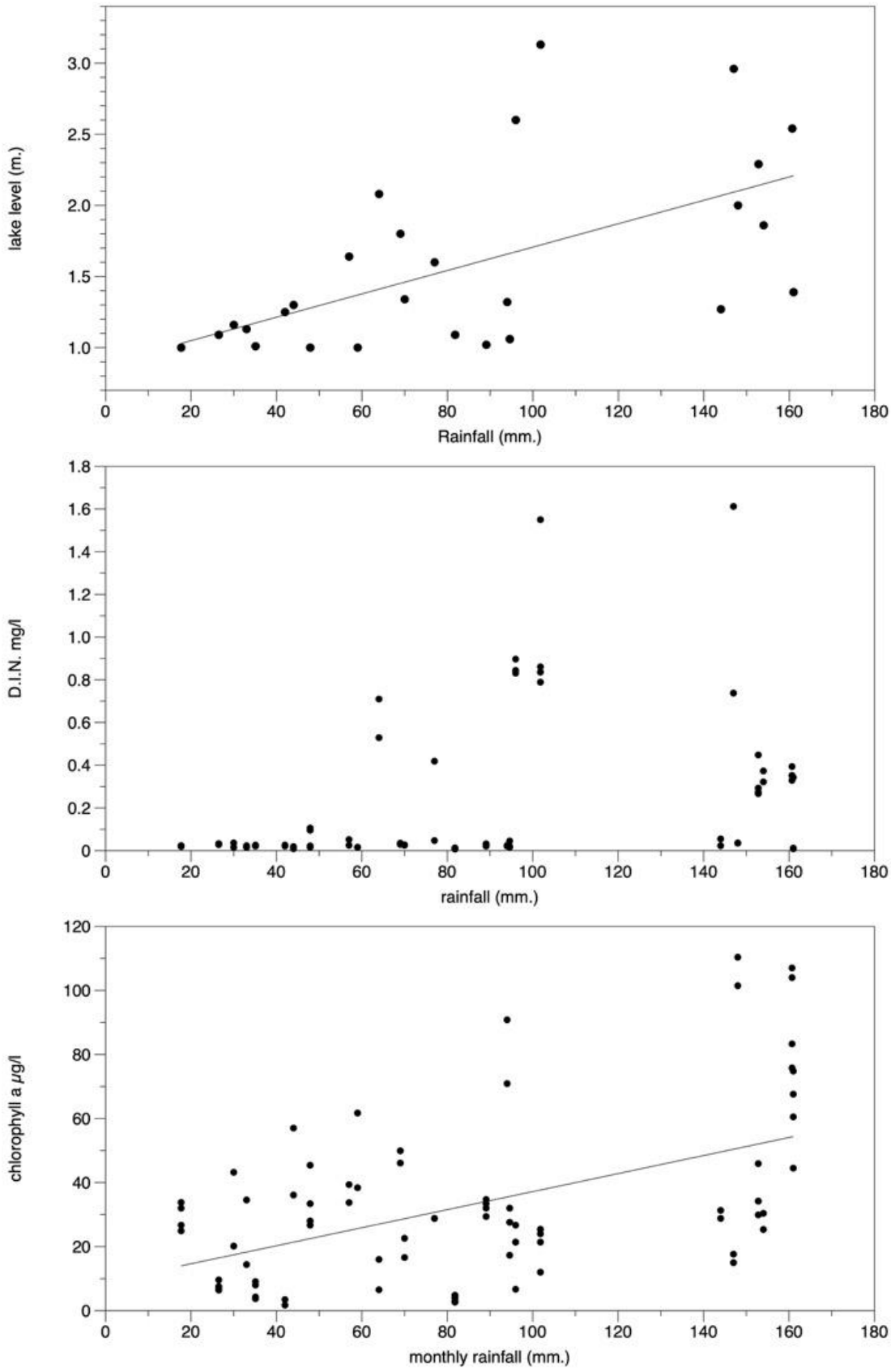

Figure 6. The relationship between summer (M, J, J, A) rainfall and lake level (top), D.I.N (middle) and chlorophyll (bottom) in Lady's Island Lake. Data from EPA surveys in 2009-2017 and the CLEAR project. Note when rainfall is less than 40 mm per month, D.I.N. is very low.

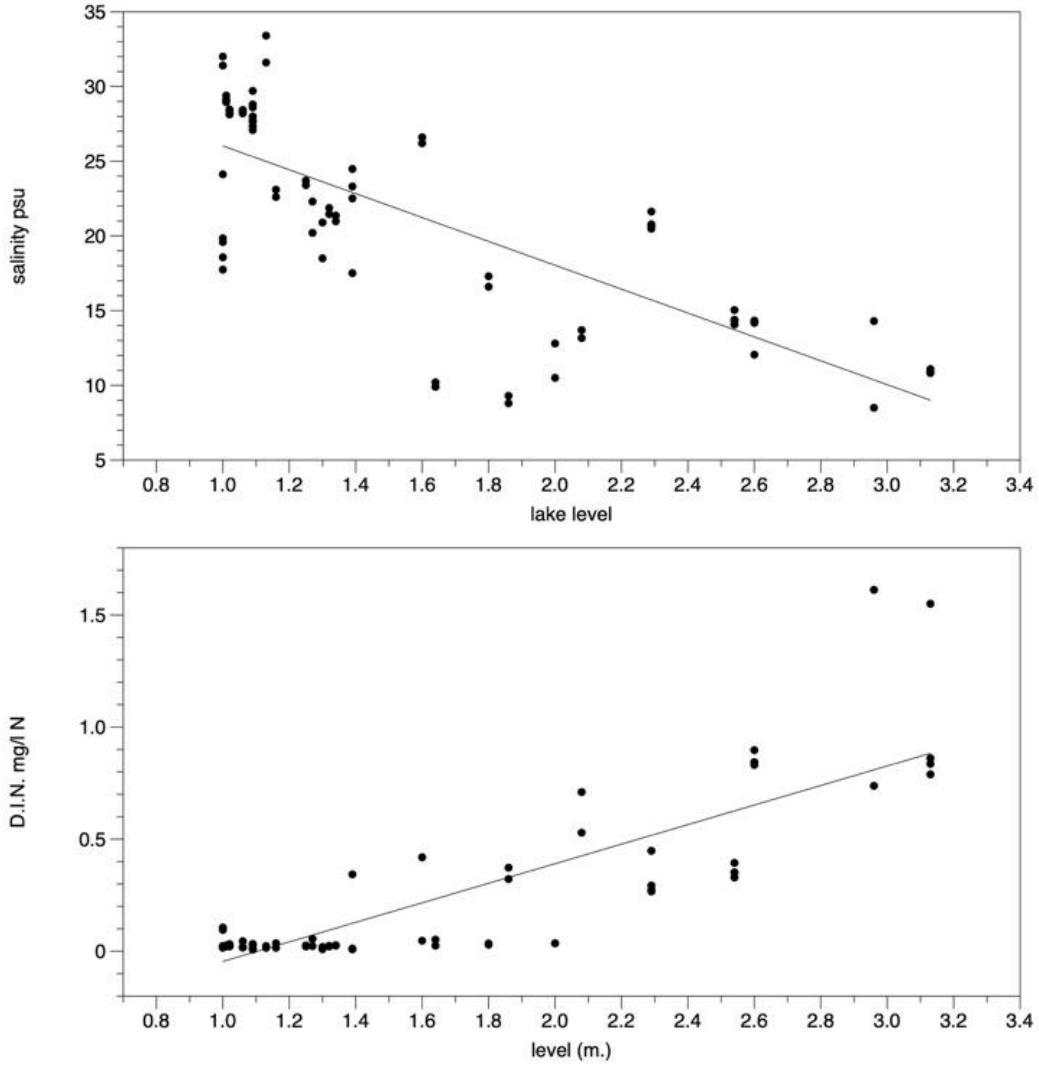

Figure 7. The relationship between lake level, salinity (top) and D.I.N. (bottom). Low lake level corresponds with high salinity and low nitrogen. Data sources as in Figure 6**.**

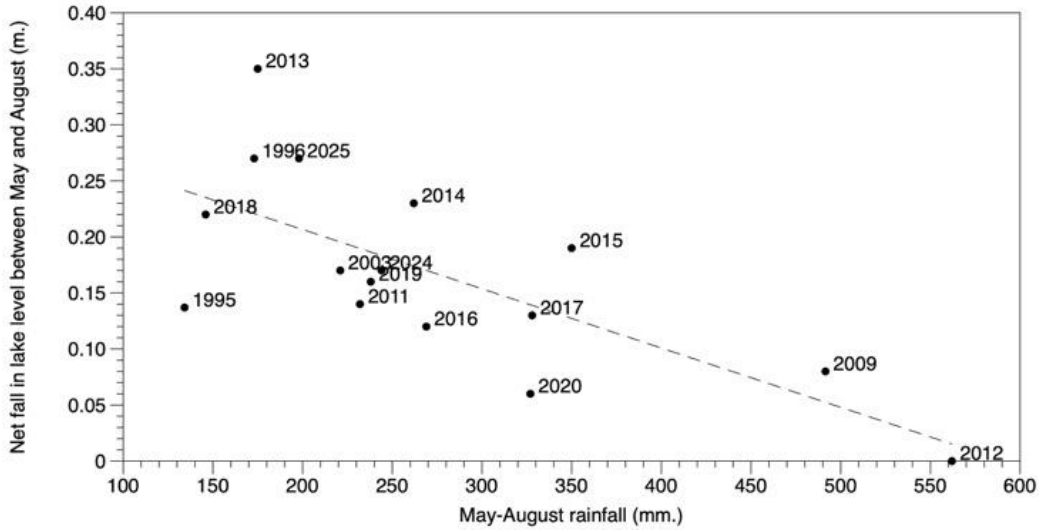

Figure 8. Year to year variation in lake level and total summer rainfall (sum of May, June, July and August). Note 2025 was an exceptionally dry year. A greater fall in lake level corresponds to less runoff from streams and ground water.

Conclusion

In 2025, both *Lamprothamniun papulosum* and *Chara canescens* were recorded in quantity from Lady's Island Lake, despite its known hypereutrophic state. The data however, show both species are confined to water depths less than 1 m, as was most of the lagoon vegetation. The widespread distribution of the rare stoneworts in 2025 contrasts with a less widespread distribution in some previous years. Their absence at depths greater than 1 m strongly suggests light limitation, as both species grow well at greater depths in other Irish lagoons. There appears to be an association between charophyte and benthic macrophyte growth generally and low lake levels and rainfall, although further work would be necessary to conclusively demonstrate this link.

At present, both species grow in a 0.5-1 m deep zone along the lake shore. Growth varies in this zone from year to year without signs of sustained decline or increase. Earlier surveys (Hatch, 1996; Healy *et al*., 1997; Healy, 1998) however indicate macrophyte growth occurred throughout the lake prior to about 1980, probably because growth was nutrient- rather than light-limited. It should also be noted that two other charophytes typical of some lagoons, *Chara aspera* and *Tolypella glomerata*, did occur in Lady's Island Lake but have not been seen there for over 20 years.

Salinity differences within the lake probably control the occurrence of *Chara canescens* which is largely confined to the north-east and south-east of the lake where it has been recorded previously on several occasions. Any radical changes in lake salinity must be expected to change the distribution of both species, with a permanent lowering of salinity leading to their extinction.

Future work

The more extensive macrophyte populations in 2025 compared to other years must not be mistaken for an improvement in the lake's environment, as the lake continues to have a large and visible algal bloom with only a small, shallow-water proportion of the bottom supporting dense vegetation. The increase in macrophyte populations may indicate that in years with less rainfall, less nutrients enter the lake. Future monitoring of benthic vegetation would allow this hypothesis to be tested and help to distinguish between the roles of internal nutrient loading and external nutrient input in driving planktonic algal growth.

The two charophyte species (*Lamprothamnium papulosum* and *Chara canescens*) are rare both in Ireland and Western Europe, and their continued survival in Lady's Island Lake is of conservation importance. Populations should be monitored frequently (every one to three years) to ensure their continued survival. Two shore transects, one each in the south-western bay (T0831 0525) and the north-eastern arm (T0679 0735), could be sampled using chest waders. Species presence and absence, abundance, companion species, maximum depth of colonisation, water transparency and salinity should be recorded. The transects should be perpendicular to the shore and have a width of 1 m. The length will depend on the lagoon state but is unlikely to exceed 10 m. Cover values and species present should be recorded for the entire 10 x 1 m space.

In addition, a third transect in the south-eastern sector where *Chara canescens* is known to occur (see Figure 2) should also be sampled frequently.

Acknowledgements

We would like to thank Mr Nick Stewart for advice and provision of historical records. Mr Jim Hurley provided historical data on lake levels.

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Appendices

Appendix 1 Pre-2025 charophyte records from Lady's Island Lake

Name	Start Date	End Date	Year	Grid Reference	Ten Km Square	Locality	Recorder	Comments
Chara aspera	01/09/1906	30/09/1906	1906	T00	T00	Lady's Island Lake	Druce, G.C.	
Chara aspera	01/07/1921	31/07/1921	1921	T00	T00	Lady's Island Lake	Stelfox, A.W.	As *C. aspera* var. *subinermis*. In a few inches of water. Also det. M.C.Knowles
Chara aspera	26/06/1922	26/06/1922	1922	T00	T00	Lady's Island Lake	Stelfox, A.W.	
Chara aspera	01/07/1922	31/07/1922	1922	T10	T10	Lady's Island Lake	Stelfox, A.W.	In a few inches of water, Lady's Island Lake
Chara aspera	05/08/1991	05/08/1991	1991	T0805	T00	Lady's Island Lake,W side	FitzGerald, Lady R., Leslie, A.C. and Stewart, N.F.	[Recorder originally input by BRC as Ratcliffe, D.A. and Thompson, B.H. but this is an error.] Shallow partly isolated drying out pool.
Chara aspera	31/07/1991	31/07/1991	1991	T00	T00	Scallan's Pool, Lady's Island Lake	Galvin, P.	
Chara aspera	05/08/1991	05/08/1991	1991	T0805	T00	Scallan's Pool, Lady's Island Lake	FitzGerald, Lady R., Leslie, A.C. and Stewart, N.F.	Small lagoon. Recorder was incorrectly input by BRC as D.A.Ratcliffe & B.H.Thompson.
Chara aspera	30/07/2003	30/07/2003	2003	T103054	T10	Carnsore:Lady's Island Lake	Roden, C.M.	Barrier lagoon. Data originally input as 29/7/1999 but this is an error
Chara canescens	24/07/1973	24/07/1973	1973	T0904	T00	Lady's Island Lake	Jermy, A.C. and Mullin, J.M.	
Chara canescens	01/07/1973	31/07/1973	1973	T1005	T10	Lady's Island Lake,E side	Booth, Miss E.M., Jermy, A.C. and Mullin, J.M.	In saline water with *Lamprothamnium* and *Tolypella* sp.:WINCH
Chara canescens	05/08/1991	05/08/1991	1991	T0805	T00	Lady's Island Lake, W side	FitzGerald, Lady R., Leslie, A.C. and Stewart, N.F.	Shallow partly isolated drying out pool.
Chara canescens	31/07/1991	31/07/1991	1991	T00	T00	Scallan's Pool, Lady's Island Lake	Galvin, P.	
Chara canescens	05/08/1991	05/08/1991	1991	T0805	T00	Scallan's Pool, Lady's Island Lake	FitzGerald, Lady R., Leslie, A.C. and Stewart, N.F.	Small lagoon.
Chara canescens	17/09/2003	17/09/2003	2003	T103054	T10	Lady's Island Lake, SE part in 10 cm water	Roden, C.M.	Barrier lagoon. Data originally input as 29/7/1999 but this is an error
Chara canescens	09/09/2010	09/09/2010	2010	T103054	T10	Lady's Island Lake, shore at Lady's Island village	Cilian Roden/Geoff Oliver	
Chara canescens	09/09/2010	09/09/2010	2010	T85054	T00	Lady's Island Lake, west end of barrier	Cilian Roden/Geoff Oliver	
Lamprothamnium papulosum	24/07/1973	24/07/1973	1973	T095042	T00	Lady's Island Lake	Jermy, A.C. and Mullin, J.M.	Growing with *Chara canescens* and *Tolypella glomerata*. Also specimen at DBN conf. N.F.Stewart.

Name	Start Date	End Date	Year	Grid Reference	Ten Km Square	Locality	Recorder	Comments
Lamprothamnium papulosum	01/07/1973	31/07/1973	1973	T1005	T10	Lady's Island Lake	Booth, E., Jermy, A.C., Mullin, J.M. & Moore, J.A.	In saline water with *Chara canescens*.; (one specimen redetermined as *C canescens* by NFS 19/3/1997):WINCH
Lamprothamnium papulosum	05/08/1991	05/08/1991	1991	T0805	T00	Scallan's Pool, Lady's Island Lake	FitzGerald, Lady R., Leslie, A.C. and Stewart, N.F.	Small lagoon.
Lamprothamnium papulosum	01/01/1996	31/12/1996	1996	T108076	T10	Lady's Island Lake, NE bay	Hatch, P.C.	
Lamprothamnium papulosum	01/01/1996	31/12/1996	1996	T083053	T00	Lady's Island Lake, W end of barrier	Hatch, P.C.	
Lamprothamnium papulosum	17/09/2003	17/09/2003	2003	T103054	T10	Lady's Island Lake, SE part in 10 cm water	Roden, C.M.	Barrier lagoon. Data originally input as 29/7/1999 but this is an error
Lamprothamnium papulosum	09/09/2010	09/09/2010	2010	T106072	T10	shore at Lady's Island village	Cilian Roden/Geoff Oliver	
Lamprothamnium papulosum	09/09/2010	09/09/2010	2010	T085054	T00	west end of barrier	Cilian Roden/Geoff Oliver	
Lamprothamnium papulosum	16/08/2016	16/08/2016	2016	T10040497	T10	Lady's Island Lake	Tennant, Frankie	Comm. Paul Green
Lamprothamnium papulosum	27/06/2017	27/06/2017	2017	T0834105327	T00	Ladys Island Lake	Roden, C.	
Lamprothamnium papulosum	27/06/2017	27/06/2017	2017	T106073	T10	shore at Lady's Island village	Cilian Roden	
Lamprothamnium papulosum	29/06/2018	29/06/2018	2018	T0833605318	T00	Rostonstown, Lady's Island Lake	Mike Wyse Jackson	Many plants growing in shallow water close to the shoreline between T0833605318 and T0835105338
Lamprothamnium papulosum	29/06/2018	29/06/2018	2018	T0835105338	T00	Rostonstown, Lady's Island Lake	Mike Wyse Jackson	Many plants growing in shallow water close to the shoreline between T0833605318 and T0835105338
Lamprothamnium papulosum			2024	T108076	T10	shore at Lady's Island village	Aquafact	
Tolypella glomerata	24/07/1973	24/07/1973	1973	T095042	T00	Lady's Island Lake	Jermy, A.C. and Mullin, J.M.	
Tolypella glomerata	05/08/1991	05/08/1991	1991	T0805	T00	Scallan's Pool, Lady's Island Lake	FitzGerald, Lady R., Leslie, A.C. and Stewart, N.F.	Small lagoon. Recorder was incorrectly input by BRC as D.A.Ratcliffe & B.H.Thompson.
Tolypella glomerata	05/08/1991	05/08/1991		T0805	T00	Rostonstown / Lady's Island Lake	FitzGerald, R.;Leslie, A.C.;Stewart, N.F.	Lady's Island Lake, W side

Appendix 2. *Lamprothamnium papulosum* (*L.p.*) records from Lady's Island Lake (LIL) from 2025 survey

Taxon	Recorder	Locality	Grid Reference	Date	Comment	Abundance	Growing with
L.p.	Paul Green	LIL	T0856705440	2025-08-01	In shallow water near margin of lake		*Ruppia maritima*
L.p.	Paul Green	LIL	T0871605369	2025-08-01	Scattered in shallow water		*Ruppia maritima*
L.p.	Paul Green	LIL	T0949306034	2025-08-11	Scattered in shallow water within 1 m of shore, over 2.5 m stretch	48	*Ruppia maritima*
L.p.	Paul Green	LIL	T1091807428	2025-08-12		14	*Ruppia maritima*
L.p.	Paul Green	LIL	T1090107262	2025-08-12			*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1089207290	2025-08-12			*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1088207314	2025-08-12			*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1086107158	2025-08-12		2	*Ruppia maritima*
L.p.	Paul Green	LIL	T1086807086	2025-08-12		6	*Ruppia maritima*
L.p.	Paul Green	LIL	T1089007362	2025-08-12			*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1090907426	2025-08-12		2	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1085507134	2025-08-12		2	*Ruppia maritima*
L.p.	Paul Green	LIL	T1088707315	2025-08-12			*Ruppia maritima*
L.p.	Paul Green	LIL	T1088707325	2025-08-12			*Ruppia maritima*
L.p.	Paul Green	LIL	T1093007346	2025-08-12	Water depth 1 cm		*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1088607375	2025-08-12			*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1090707418	2025-08-12		3001-10000	*Ruppia maritima* and a little *Stuckenia pectinata*
L.p.	Paul Green	LIL	T1086807087	2025-08-12	Water depth 3 cm	31-100	With very little *Ruppia maritima*
L.p.	Paul Green	LIL	T1091707423	2025-08-12		5	*Ruppia maritima* and a little *Stuckenia pectinata*
L.p.	Paul Green	LIL	T1088807413	2025-08-12		3001-10000	With very little *Ruppia maritima*
L.p.	Paul Green	LIL	T1022406065	2025-08-27		1	*Ruppia maritima*
L.p.	Paul Green	LIL	T1021706061	2025-08-27	Area 3x4 m. Water depth 5 cm	101-300	*Ruppia maritima*
L.p.	Paul Green	LIL	T1021406059	2025-08-27		18	*Ruppia maritima*
L.p.	Paul Green	LIL	T1023006071	2025-08-27	Water depth 7 cm	11	*Ruppia maritima*
L.p.	Paul Green	LIL	T1023606073	2025-08-27	Water depth 1 cm	4	*Ruppia maritima*
L.p.	Paul Green	LIL	T1024206077	2025-08-27	Water depth 2 cm	31-100	*Ruppia maritima*
L.p.	Paul Green	LIL	T1023006135	2025-08-27	Water depth 1 cm	16	*Ruppia maritima*
L.p.	Paul Green	LIL	T1022706150	2025-08-27	Water depth 2 cm	9	*Ruppia maritima*
L.p.	Paul Green	LIL	T1021606152	2025-08-27	Water depth 1 cm	34	*Ruppia maritima*
L.p.	Paul Green	LIL	T1019306157	2025-08-27	Water depth 1 cm	1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green	LIL	T1040006493	2025-08-27	Water depth 20 cm. Area 20 x 10 m	301-1000	*Ruppia maritima*
L.p.	Paul Green	LIL	T1044606471	2025-08-27	Water depth 10 cm. Area 25 x 10 m	1001-3000	*Ruppia maritima*

Taxon	Recorder	Locality	Grid Reference	Date	Comment	Abundance	Growing with
L.p.	Paul Green	LIL	T1044706465	2025-08-27	Water depth 20 cm to 5 cm. In open water as well as amongst sea clubrush. Area 40 x 10 m		*Ruppia maritima*
L.p.	Paul Green	LIL	T1048906457	2025-08-27	Water depth 1cm to 10 cm. Area 8 m x 15 m.	1001-3000	*Ruppia maritima*
L.p.	Paul Green	LIL	T1053606449	2025-08-27	Water depth 20 cm	19	*Ruppia maritima*
L.p.	Paul Green	LIL	T1053406438	2025-08-27	Water depth 20 cm	101-300	*Ruppia maritima*
L.p.	Paul Green	LIL	T1055906432	2025-08-27	Water depth 22 cm	3	*Ruppia maritima*
L.p.	Paul Green	LIL	T1022106180	2025-08-27	Pond, east side. Water depth 5 cm	31-100	With *Ruppia maritima* and *Stuckenia pectinata*
L.p.	Paul Green	LIL	T0988505301	2025-08-27	Water depth 15 cm	1	*Ruppia maritima*
L.p.	Paul Green	LIL	T0994905342	2025-08-27	Water depth 8 cm	1001-3000	Without any *Ruppia*
L.p.	Paul Green	LIL	T0997605360	2025-08-27	Extremely abundant. Water depth 6 cm	3001-10000	Without any *Ruppia*
L.p.	Paul Green	LIL	T1001405456	2025-08-27	Water depth 6 cm	1001-3000	*Stuckenia pectinata*
L.p.	Paul Green	LIL	T0995205385	2025-08-27		3001-10000	Without any *Ruppia*
L.p.	Paul Green	LIL	T1002405445	2025-08-27	Water depth 5 cm	3001-10000	With a little *Stuckenia pectinata*
L.p.	Paul Green	LIL	T1005105419	2025-08-27		3001-10000	Without any *Ruppia*
L.p.	Paul Green	LIL	T1008905415	2025-08-27			*Ruppia maritima*
L.p.	Paul Green	LIL	T1007405410	2025-08-27		1001-3000	Without any *Ruppia*
L.p.	Paul Green	LIL	T1007305356	2025-08-27	Water depth 3 cm	101-300	Without any *Ruppia*
L.p.	Paul Green	LIL	T1005705364	2025-08-27	Water depth 3 cm	101-300	Without any *Ruppia*
L.p.	Paul Green	LIL	T1003105374	2025-08-27	Water depth 3 cm	1001-3000	Without any *Ruppia*
L.p.	Paul Green	LIL	T1000205364	2025-08-27	Water depth 3 cm	3001-10000	Without any *Ruppia*
L.p.	Paul Green	LIL	T0997805317	2025-08-27		1001-3000	Without any *Ruppia*
L.p.	Paul Green	LIL	T0997305300	2025-08-27	Water depth 4 cm	7	With very little *Ruppia maritima*
L.p.	Paul Green	LIL	T0997005398	2025-08-27			With very little *Ruppia maritima*
L.p.	Paul Green	LIL	T0998305282	2025-08-27	Water depth 10 cm	3	With very little *Ruppia maritima*
L.p.	Paul Green	LIL	T1002405279	2025-08-27	Water depth 3 cm	2	*Ruppia maritima*
L.p.	Paul Green	LIL	T1002605279	2025-08-27	Water depth 3 cm	13	*Ruppia maritima*
L.p.	Paul Green	LIL	T1003105272	2025-08-27	Water depth 2 cm	1	*Ruppia maritima*
L.p.	Paul Green	LIL	T1002605263	2025-08-27	Water depth 1 cm	1	*Ruppia maritima*
L.p.	Paul Green	LIL	T1004005172	2025-08-27	Water depth 8 cm	11	*Ruppia maritima*
L.p.	Paul Green	LIL	T1017505526	2025-08-27	Water depth 35 cm	1001-3000	Without any *Ruppia*
L.p.	Paul Green	LIL	T1027605542	2025-08-27			With very little *Ruppia maritima*
L.p.	Paul Green	LIL	T0999505349	2025-08-27			With very little *Ruppia maritima*
L.p.	Paul Green	LIL	T101054	2025-08-27		1001-3000	Without any *Ruppia*

Taxon	Recorder	Locality	Grid Reference	Date	Comment	Abundance	Growing with
L.p.	Paul Green	LIL	T103054	2025-08-27	Water depth 1 cm	1	Without any *Ruppia*
L.p.	Paul Green	LIL	T102054	2025-08-27	Water depth 11 cm	101-300	Without any *Ruppia*
L.p.	Paul Green; Cilian Roden; Áine O Connor	LIL	T0866105491	2025-09-16			*Ruppia maritima*
L.p.	Paul Green; Cilian Roden; Áine O Connor	LIL	T0866505485	2025-09-16			*Ruppia maritima*
L.p.	Paul Green; Cilian Roden; Áine O Connor	LIL	T0868105464	2025-09-16			*Ruppia maritima*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T1002505158	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0972704735	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0973404730	2025-09-17		2	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0972004738	2025-09-17		2	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0969804753	2025-09-17		2	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0973004732	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0978504706	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0975504723	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0981604688	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0978504709	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Cilian Roden; Paul Murphy	LIL	T0986704665	2025-09-17		1	*Ruppia maritima* and *Ruppia spiralis*
L.p.	Paul Green; Matt Jones	LIL	T0995804741	2025-08-22	Scattered amongst rocks		Ruppia maritima and Ruppia spiralis
L.p.	Cilian Roden; Paul Murphy; Áine O Connor	LIL	T1070706983	2025-09-16		rare	*Ruppia* sp., *Stuckenia pectinata, Ulva intestinalis*
L.p.	Cilian Roden; Paul Murphy	LIL	T0868505479	2025-09-25	in *Ruppia* sward	1	*Ruppia* sp.
L.p.	Cilian Roden; Paul Murphy	LIL	T0832905310	2025-09-25	in *Ruppia* sward	1	*Ruppia* sp.

Appendix 3. *Chara canescens* records from Lady's Island Lake (LIL) from 2025 survey

Taxon	Recorder	Locality	Grid Reference	Precision (m)	Date	Abundance	Growing with
Chara canescens	Paul Green	LIL	T1091807344	5	2025-08-12		*Lamprothamnium papulosum*
Chara canescens	Paul Green	LIL	T1090407414	3	2025-08-12		*Lamprothamnium papulosum,* both *Ruppia* species*, Stuckenia pectinata*
Chara canescens	Paul Green	LIL	T1088107422	8	2025-08-12		*Lamprothamnium papulosum*
Chara canescens	Paul Green	LIL	T1089307367	2	2025-08-12		*Lamprothamnium papulosum*
Chara canescens	Paul Green	LIL	T1009605437	5	2025-08-27	301-1000	*Lamprothamnium papulosum*
Chara canescens	Paul Green	LIL	T1009705438	2	2025-08-27	101-300	*Lamprothamnium papulosum*
Chara canescens	Paul Green	LIL	T1018405526	3	2025-08-27	31-100	*Lamprothamnium papulosum*
Chara canescens	Paul Green	LIL	T0997405376	2	2025-08-27	301-1000	*Lamprothamnium papulosum* and *Ruppia maritima*
Chara canescens	Paul Green	LIL	T1005005419	2	2025-08-27	1001-3000	*Lamprothamnium papulosum*

Appendix 4. Vegetation samples from the north-eastern arm (LI1) and south-western corner (LI2**)**

Station	LI1	LI1	LI1	LI1	LI2	LI2	LI2	LI2
Depth range (m)	0.5	0-1.2	0.5-1.5	0-1.5	0.6	0-1.4	0-1.5	0-1.0
	1996	30/07/2003	27/062017	18/09/2025	1996	30/07/2003	27/06/2017	15/09/2025
Ruppia spiralis				2		1	1	3
Ruppia maritima		1	2	2		+		
Ruppia sp.	4				5		1	3
Stuckenia pectinata		1		3		2		
Schoenoplectus tabernaemontani			2					
Bolboschoenus maritimus			2					
Lamprothamnium papulosum	+	+	1	1	1		1	1
Chaetomorpha linum			3				+	1
Cladophora sp.			1	2			2	1
Ulothrix							1	
Ulva intestinalis	1		1	1	1		2	