

NPWS

Lady's Island Lake SAC
(site code: 000704)

**Conservation objectives supporting document-
Coastal lagoons**

Version 1
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Please note that this document should be read in conjunction with the following report: NPWS (2019) Conservation Objectives: Lady’s Island Lake SAC 000704. Version 1.0. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

1. Introduction

1.1 Lady's Island Lake SAC

Lady's Island Lake SAC, situated in the south-east of Ireland in Co. Wexford, encompasses a large shallow, brackish coastal lagoon separated from the sea by a sand and shingle barrier. Oliver (2007) describes the lagoon as "an excellent example of a large, natural sedimentary lagoon and based on geomorphology alone is one of the largest and best examples of a coastal lagoon in Ireland".

This Special Area of Conservation (SAC) is selected for reefs (EU Habitats Directive code 1170) and perennial vegetation of stony banks (1220), as well as coastal lagoons (1150); all habitats listed on Annex I of the Habitats Directive.

"Coastal lagoons" is a priority habitat on Annex I of the EU Habitats Directive. A coastal lagoon is a lake or pond that is fully or partially separated from the sea by a permeable barrier that can be entirely natural, such as shingle, or can be an artificial embankment. Salinity varies depending on factors such as freshwater inputs and barrier permeability. Lagoons support unique assemblages of flora and fauna, particularly invertebrates. In Ireland, coastal lagoons are considered to be in bad conservation status due to issues such as drainage and water pollution (NPWS, 2013).

A single lagoon, Lady's Island Lake, is listed for this SAC (Oliver, 2007). The table below gives the conservation status assessment of this lagoon as outlined in Oliver (2007). See the map in Appendix 1 and see Appendix 2 for an account of the Lady's Island Lake site (from Oliver, 2007).

Code ¹	Name	County	Conservation Assessment
IL006	Lady's Island Lake	Wexford	Unfavourable - bad

¹ Code is that used in Oliver (2007)

1.2 Conservation objectives

A site-specific conservation objective aims to define the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.

Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, and structure and functions.

Provisional reference conditions for Irish lagoons are proposed by Roden and Oliver (2013). Reference conditions aim to define ecological status prior to human impacts (i.e. "natural" conditions). The targets for the water quality attributes given below are based on reference values given by Roden and Oliver (2013).

Attributes and targets may change/become more refined as further information becomes available.

2. Area

The favourable reference area for Lady's Island Lake is 299.6ha.

Code ¹	Name	Area (ha) ²
IL006	Lady's Island Lake	299.6

¹ Code is that used in Oliver (2007).

² Area is calculated from spatial data derived from Oliver (2007).

The target for habitat area is: stable or increasing, subject to natural processes.

3. Range

The mapped distribution of the lagoon habitat (i.e. Lady's Island Lake) in Lady's Island Lake SAC is shown in Appendix 1.

The target for the habitat distribution attribute is: no decline, subject to natural processes.

4. Structure and functions

Structure and functions relates to the physical components of a habitat ("structure") and the ecological processes that drive it ("functions"). For lagoons, these include attributes such as salinity, hydrology and various water quality attributes.

4.1 Salinity regime

Lagoons can vary considerably in salinity both within and between sites depending on the volume and timing of inflowing and outflowing freshwater and seawater. Salinity is probably the most important variable in the classification of lagoon types (Roden and Oliver, 2013). Freshwater enters Lady's Island Lake by a few small streams on the northern and north-western sides of the lake and leaves by percolation through the barrier at its southern end. The water level rises according to rainfall, thus typically in winter, and the barrier is usually manually breached in spring to prevent flooding of adjacent land. The lagoon then becomes tidal until there is a natural closure of the barrier, which generally takes two weeks to six months. Seawater also enters by seepage and overwash of the barrier. Salinity fluctuates widely according to season and the extent of tidal flow. In October 1996, 4–15psu (practical salinity units) was measured at the north end, 23–26psu near the barrier and 6–10psu in an isolated pool. Using information from Oliver (2007), the following table gives the salinity class for this lagoon. See Roden and Oliver (2013) for further information on salinity classes and see Appendix 2 for the site report.

Code	Name	Salinity
IL006	Lady's Island Lake	Meso-euhaline

The target for the salinity regime attribute is: median annual salinity and temporal variation within natural range.

4.2 Hydrological regime

Fluctuations in water depth are a natural feature of lagoon hydrology. However, if water levels fluctuate beyond their natural values due to issues such as drainage, the condition of the habitat can deteriorate. Lady's Island Lake can be classified largely as shallow (maximum depth is recorded as 6m), thus, even small changes in water depth can cause significant losses in habitat area. Further information is required to investigate historic fluctuations to enable more specific targets to be set. See Appendix 2 for the site report.

The target for hydrological regime is: annual water level fluctuations and minima within natural ranges.

4.3 Barrier: connectivity between lagoon and sea

The morphology of the barrier between a lagoon and the sea determines how it functions ecologically. Changes to the barrier can be due to natural processes such as storms, but they can also be modified through human intervention. Active management is sometimes necessary, particularly if the lagoon is artificial. Lady's Island Lake is a natural sedimentary percolating lagoon, separated from the sea by a sand and gravel barrier and dunes, which is summarised in the following table (after Oliver, 2007). See also the site report in Appendix 2.

Code	Name	Barrier Type
IL006	Lady's Island Lake	Natural sedimentary lagoon with a sand-gravel barrier

The target for the attribute barriers: connectivity between lagoon and sea is: appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management.

4.4 Water quality - Chlorophyll *a*

This attribute indicates the level of phytoplankton in the water column. Roden and Oliver (2013) make the assumption that, for shallow lagoons in "natural" condition, primary productivity is dominated by the benthos rather than the plankton. Phytoplankton tends to increase in density in response to increasing nutrient levels. Excessive shading from phytoplankton can reduce submergent macrophyte colonisation of the littoral zone of lagoons.

The target for the attribute water quality - Chlorophyll *a* is: median annual chlorophyll *a* within natural ranges and less than 5µg/L. The target is based on Roden and Oliver (2013).

4.5 Water quality - Molybdate reactive phosphorus (MRP)

The target for the attribute water quality - Molybdate Reactive Phosphorus (MRP) is: median annual MRP within natural range and less than 0.1mg/L. The target is based on Roden and Oliver (2013).

This limit is required to ensure that excessive shading from phytoplankton does not reduce submergent colonisation of the littoral zone.

4.6 Water quality - Dissolved inorganic nitrogen (DIN)

The target for the attribute water quality - Dissolved Inorganic Nitrogen (DIN) is: median annual DIN within natural ranges and less than 0.15mg/L. The target is based on Roden and Oliver (2013).

As for phosphorus, the limit set for nitrogen is to ensure that excessive shading from phytoplankton does not reduce submergent colonisation.

4.7 Depth of macrophyte colonisation

The maximum depth recorded at Lady's Island Lake is 6m. It is expected that macrophytes would extend down to a depth of at least 2m.

The target for the attribute depth of macrophyte colonisation is: macrophyte colonisation to at least 2m depth.

4.8 Typical plant species

As lagoonal specialist species do not easily recolonise, their presence is one of the indicators of long-term continuity of quality. The plant species recorded in Lady's Island Lake is summarised in Oliver (2007). Species considered to be lagoonal specialists include *Chara canescens*, *Lamprothamnium papulosum*, *Ruppia maritima* and *Ruppia cirrhosa*. See Appendix 2 for the site report.

The target for the attribute typical plant species is: maintain number and extent of listed lagoonal specialists, subject to natural variation.

4.9 Typical animal species

Some invertebrate species are regarded as lagoonal specialists and their presence can indicate long-term quality. As species found within each lagoon can vary considerably, depending on other attributes such as salinity, the target is based on site-specific species lists. The species recorded in Lady's Island Lake are summarised in Oliver (2007). See Appendix 2 for the site report.

The target for the attribute typical animal species is: maintain listed lagoonal specialists, subject to natural variation.

4.10 Negative indicator species

Negative indicator species include non-native alien species as well as those that are not typical of the habitat. For example, accelerated encroachment by reedbeds can be caused by low salinity, shallow water and elevated nutrient levels.

The target for the attribute negative indicator species is: negative indicator species absent or under control.

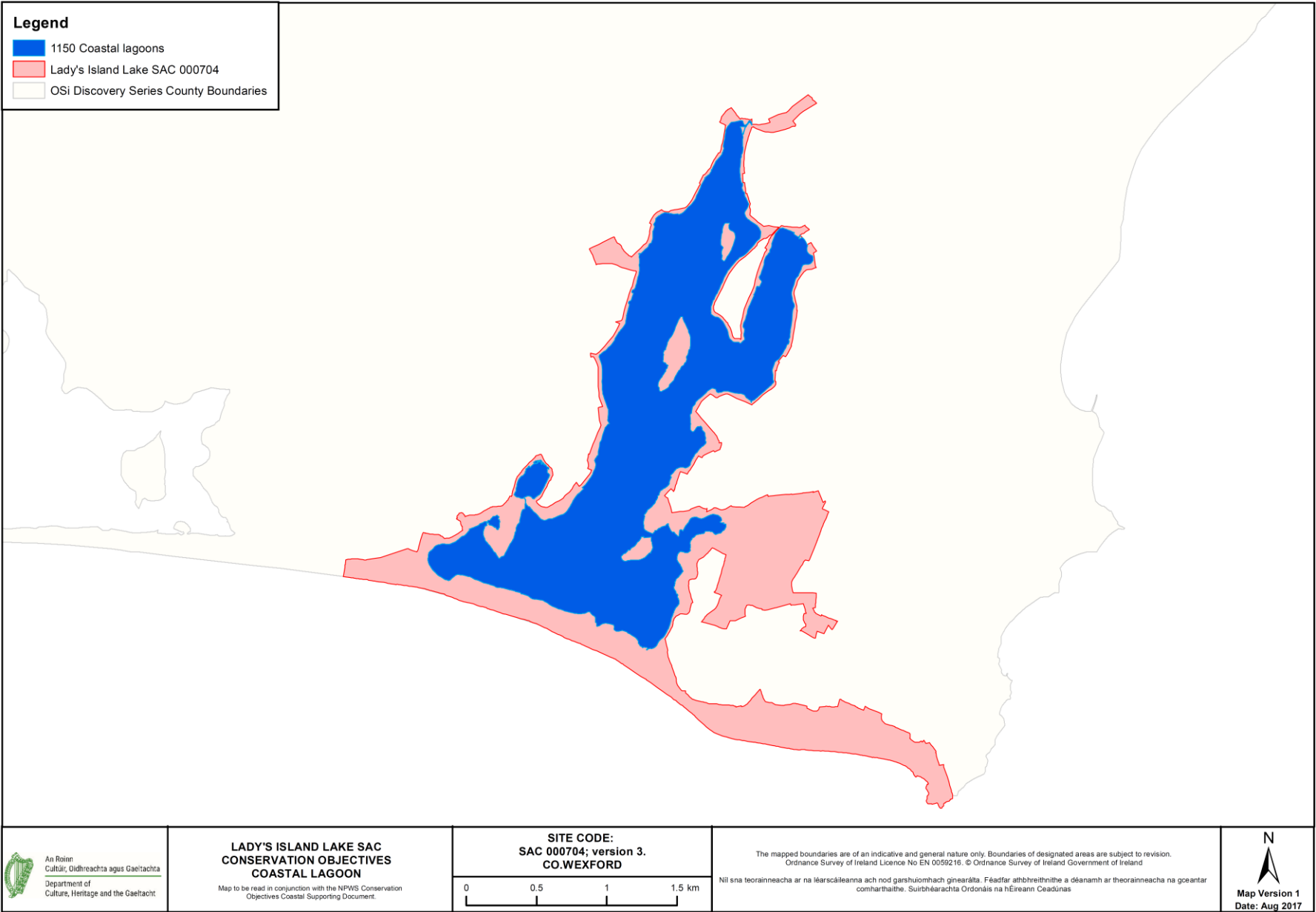
5. References

NPWS (2013) The status of EU protected habitats and species in Ireland. Unpublished report, National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Oliver, G. (2007) Inventory of Irish coastal lagoons (version 2). Unpublished report to the National Parks and Wildlife Service.

Roden, C.M. and Oliver, G. (2013) Monitoring and assessment of Irish lagoons for the purpose of the EU Water Framework Directive. Unpublished report to the Environmental Protection Agency.

Appendix 1 Distribution map of coastal lagoons in Lady's Island Lake SAC



Appendix 2 Site report

The following is the site account from Oliver (2007)

Code¹	Name
IL006	Lady's Island Lake

¹ Code is that used in Oliver (2007).

Lady's Island Lake was surveyed in 1996 for vegetation (Hatch 1996, Hatch & Healy 1998), aquatic fauna (Healy & Oliver 1996, Oliver & Healy 1998) and ecotonal coleoptera (Good 1996, Good & Butler 1998). Vegetation was surveyed again in 2003 (Roden 2004). Results of these surveys are summarised by Healy *et al.* (1997a,b,c), Healy & Oliver (1998) and Healy (1999, 2003). Sampling stations for fauna do not necessarily correspond with those of flora or ecotonal coleoptera.

Flora

The lagoon was surveyed in 1996 (Hatch 1996; Hatch and Healy 1998) by transects only. Six transects were carried out at the lagoon and one in a semi-isolated pool in the south west of the site. This is one of the three Irish sites at which *Lamprothamnium papulosum* had been recorded prior to this survey. This rare charophyte was found in the course of this survey at the western end of the barrier and in a sheltered bay in the north east corner. Its presence alone qualifies this as a valuable site.

Ruppia was found at all six lagoon transects, with a cover of 50% or more at three of these, one in each of the two northern bays and one at the west end of the barrier. It is notable that both *Ruppia cirrhosa* and *R. maritima* occur here.

Potamogeton pectinatus was not found in the lagoon but was abundant in the semi-isolated pool, which had a much lower salinity level (5 parts per thousand) than the lagoon itself (14-23 parts per thousand).

Marginal vegetation does not seem to be of particular interest here. *Scirpus maritimus*, *Schoenoplectus lacustris* ssp. *tabernaemontani* and *Phragmites australis* swamps all occur at this site, but are nowhere extensive. *Juncus gerardii* dominated salt tolerant community occurs on more open shores.

The basis for the designation of Lady's Island Lake in 1996 as valuable was the presence of *Lamprothamnium papulosum* and both *Ruppia* species and the apparent wide distribution of all these species.

The lagoon was surveyed again in 2003 (Roden 2004) when attempts were made to make underwater observations but this was impossible due to a massive algal bloom. No benthic macrophytes could be found, even by grapnel, in water more than 50cm deep. *Lamprothamnium papulosum* and *Chara canescens* were found in the southeastern part of the lagoon in September in very shallow water (<10cm) together with the two species of *Ruppia* and *P. pectinatus* but plants were small and scattered. It was concluded that no benthic macrophytes were growing in water more than 50cm and therefore that 90% of the lagoon was unvegetated due to extreme eutrophication.

Conclusions

Despite the extreme eutrophication, four of the floral species found are listed as lagoonal specialists and two of these are very rare:

Chara canescens was recorded in **eight lagoons** during the surveys - North Slob, Lady's Island L., and Tacumshin L., Co. Wexford, L. Gill, Co. Kerry, L. Murree, Co. Clare, Tanrego, Co. Sligo and Durnesh L. and Inch L., Co. Donegal (Hatch & Healy, 1998; Roden, 1998; Roden 2004). It was also recorded at Shannon Lagoon in 1996 (Hatch and Healy 1998), but not refound at that site in 2003 (Roden 2004). This species is listed in the Red Data Book for Britain and Ireland (Stewart and Church 1992). Although recorded from several European countries it is believed to be declining. It is believed to be extinct in Holland, and there are only a few records from the U.K. since 1960 and these Irish locations are very important in European terms.

Lamprothamnium papulosum was known from only three sites in Ireland before 1996 (Hatch and Healy 1998). As a result of the surveys it was relocated at two of these sites (Lady's Island L., Co. Wexford, L. Murree, Co. Clare), but not at Tacumshin L.,

Co. Wexford. It is also now known from a total of 14 lagoon sites, most of which are clustered in Connemara, but there are also new records from the North Slob, Co. Wexford, L. Bofin, Co. Galway and Maghery, Co. Donegal. This species is listed in the Red Data Book for Britain and Ireland. Although recorded from the Baltic to the Mediterranean and Black Sea and also South Africa, it is believed to be declining in Europe. There are only five recent records from the south of England, but there are 12 important sites in the Outer Hebrides (Bamber et al. 2001b). These Irish locations are very important in European terms.

Ruppia spp. are the most characteristic aquatic plant taxa of Irish coastal lagoons. The species are hard to distinguish when not flowering, and remain uncertain at some sites, but *Ruppia* of one species or the other (*R. maritima*, *R. maritima* var *brevirostris*, *R. cirrhosa*) was found at 62 of the 87 lagoons (71.3%) surveyed, and is one of the most useful indicators of coastal lagoon status.

Ruppia maritima appears to be the more common of the species and was found at 41 of the lagoons surveyed. *Ruppia cirrhosa* is believed to tolerate higher salinities than the former species and to be less common, but neither of these statements is clearly supported in Irish lagoons and the two species were often found growing together. *Ruppia cirrhosa* was only identified at 22 lagoons, but species was not determined at 12 sites. *Ruppia maritima* var *brevirostris* was only positively identified at two sites (Ballyteige, Co. Wexford and Inch L., Co. Donegal).

Based on vegetation, Lady's Island Lake is rated as of **high conservation value**, but the extreme eutrophication is very worrying.

Fauna

The fauna of Lady's Island Lake was surveyed in 1996 (Healy and Oliver 1996; Oliver and Healy 1998) at five sampling stations (Figure 6.2, Table 6.1).

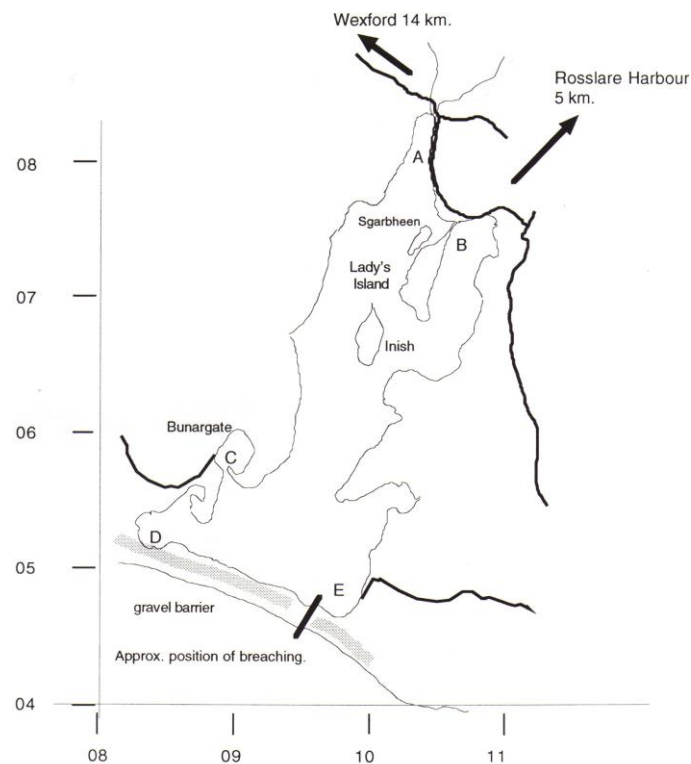


Figure 2.1.2 Location Map of Sampling Stations in Lady's Island Lake

Figure 6.2 Faunal sampling stations used at Lady's Island Lake

Table 6.1 Positions of sampling stations in Lady's island Lake, with sampling date, salinity, depth of water and type of substratum.

Sampling Stations					
	Sta A	Sta B	Sta C	Sta D	Sta E
GPS position	T 1046 0810	T 1069 0749	T 0894 0574	T 0834 0529	T 0989 0483
Sampling dates	1-3/10/96	1-3/10/96	1-3/10/96	1-3/10/96	1-3/10/96
Salinity(psu)	4-15	23	6-10	26	25
Depth(cm)	0-60	0-75	10-50	0-100	0-80
Substratum	Gravel, sand and silt	Gravel and stones, anoxic mud at depth	Fine sand, silt and anoxic mud	Gravel, sand, silt. Occasional stones.	Coarse sand, large granite boulders.

In 1996, a total of 38 faunal taxa were recorded, of which 35 were identified to species (Table 6.2) and eight of these taxa are regarded as lagoonal specialists. No live specimens of *Cerastoderma glaucum* were found at this time although empty shells were numerous. Live specimens were recorded in 1971 by Boyden and Russell (1972), in 1976-77 (Healy *et al.* 1982) and a thriving population has been observed on several occasions since (e.g. Galvin 1992). Two other Coleopteran species (*Agabus conspersus*, *Ochthebius marinus*), which are also lagoonal specialists, were recorded in the past.

Idotea chelipes is a common, lagoonal, isopod crustacean, often found in association with the lagoonal form of *Chaetomorpha linum*. Found at 23 of the 87 (26.4%) lagoons surveyed, mostly at relatively high salinity.

Lekanesphaera hookeri is a common lagoonal isopod crustacean, found at 37 of the 87 lagoons surveyed (42.5%).

Palaemonetes varians Decapod crustacean listed as a lagoonal specialist in the U.K. by Barnes (1989) and Bamber (1997), but apparently is no longer regarded as such. Although found in estuaries, this species appears to be far more characteristic of lagoons in Ireland, found in 64 of the 87 lagoons surveyed (73.6%) and may require a lagoonal environment for reproduction. Therefore, it remains on the proposed list of lagoonal specialists for Ireland.

Notonecta viridis Hemipteran insect (back-swimmer) recorded on the east coast at Kilcoole, on the south coast at North Slob, Lady's Island L., Tacumshin L., Ballyteige, Clogheen/White's Marsh and Kilkeran L. and also on the west coast at Reenydonegan, Co. Cork and L. Donnell, Co. Clare. A rare brackish water species in Ireland. According to Southwood and Leston (1959), it was recorded only for Wexford and North Kerry. Recorded previously in Lady's Island L (Healy *et al.* 1982) in Lady's Island L. and the North Slob by Galvin (1992) and from the Dingle Peninsula by McCarthy and Walton (1980). *N. viridis* is found at inland sites in the U.K. but appears to be largely restricted to lagoons in Ireland, and was proposed as a lagoonal specialist for Ireland by Oliver and Healy (1998).

Sigara stagnalis Hemipteran insect (water-boatman). A common lagoonal specialist found at 36 of the 87 (41.4%) lagoons surveyed.

Agabus conspersus Water-beetle listed by Barnes (1989) and Bamber (1997) as a lagoonal specialist in the U.K. but is no longer regarded as such. This species remains on the proposed list of Irish lagoonal specialists until more is known of its status and ecology in Ireland. Identified from samples collected at Ballyteige and the North Slob by Galvin in 1991 and previously recorded in Lady's Island L. by Healy (1997). One specimen was taken at an unsurveyed site near Garretstown, Co. Cork in 1998. This brackish water species appears to have become rare and there are only two other recent Irish records: from a salt marsh in Co. Meath, and at Dundalk harbour, Co. Louth (Nelson *et al.* 1997).

Table 6.2 Aquatic Fauna Recorded at Lady's Island Lake, Co. Wexford. July and October 1996. L.T. = light trap; () = records for July. + = present; r = rare, o = occasional, c = common, a = abundant, F = fyke net. Text in bold indicates lagoonal specialist or notable species.

		Stations									
		A	L.T.A	B	L.T.B	C	L.T.C	D	L.T.D	E	L.T.E
Annelida	<i>Arenicola marina</i>			+				+			
	<i>Hediste diversicolor</i>	+		+						+	
Crustacea											
	Cirripedia <i>Balanus improvisus</i>	+		+				o		a	
	Mysidacea <i>Neomysis integer</i>			(a)		o	c100	o	c.100	o	31
	<i>Praunus flexuosus</i>			1						+	1
	Isopoda <i>Idotea chelipes</i>	c		o	4			o	1	+	9
	<i>Lekanesphaera hookeri</i>	a	>100	+	38	a	c300	+	75	+	1
	Amphipoda <i>Gammarus zaddachi</i>	+				+	+				
	Decapoda <i>Carcinus maenas</i>	F1,7		F2,7				F3,4		F4,3	
	<i>Crangon crangon</i>							3		1	
	<i>Palaemonetes varians</i>	a	>100	a	82	a	130	o	5	o	5
Acarina	Indet.						1				
Insecta											
	Odonata <i>Ischnura elegans</i>	+				+					
	Hemiptera Corixidae	+	+	a	+	a	a				
	<i>Corixa panzeri</i>							+			
	<i>Callicorixa praeusta</i>							+			
	<i>Sigara dorsalis</i>	+									
	<i>S. concinna</i>	+				a	a				
	<i>S. stagnalis</i>	+	+	a	+	+					
	<i>Notonecta viridis</i>	+	+	+		+					
	Coleoptera <i>Colymbetes fuscus</i>										
	<i>Enochrus bicolor</i>	+									
	<i>Graptodytes granularis</i>										
	<i>Noterus clavicornis</i>					+					
	Diptera Chironomidae	+		a		+		o		o	
	Ephydriidae pupa			1							
Mollusca											
	Prosobranchia <i>Hydrobiidae</i>	c	>100	o		+		o	c20	+	
	<i>Hydrobia ventrosa</i>	8		1				o	c20		
	<i>Potamopyrgus antipodarum</i>	12	+			+					
	Bivalvia <i>Cerastoderma glaucum</i>	shells		shells				shells			
Bryozoa		+						+		+	
Teleostei											
	<i>Anguilla anguilla</i>	F, 5		F,13				F,5			
	<i>Gasterosteus aculeatus</i>	+	c50	o	1	o	a	o		+	
	Mugilidae	F1,17									
	<i>Platichthys flesus</i>	F1,7		F2,6				F3,6		F4,5	
	<i>Pollachius pollachius</i>							F,3			
	<i>Pomatoschistus microps</i>	a	>100	+	14			a		a	3
	<i>Spinachia spinachia</i>										
	<i>Sprattus sprattus</i>	F, 1									
	<i>Syngnathus acus</i>							1			

Enochrus bicolor Water-beetle recorded at 12 lagoons of the 87 surveyed, from the southern half of the country from Co. Wicklow to Connemara including the Aran Islands. There are only two recent records from N. Ireland (Nelson *et al.* 1998).

Ochthebius marinus Water-beetle identified from Tacumshin L. in 1996, by Galvin from Lady's Island and Tacumshin in 1991, and at Clogheen/White's Marsh, Co. Cork in 2003. Only recorded from one 10-km square in Ireland by Foster *et al.* (1992). Four recent records from Co. Down (Nelson *et al.* 1998).

Hydrobia ventrosa. Gastropod mollusc commonly found in brackish lagoons and ditches and generally not on the open coast. Recorded at 18 of the 87 (20.7%) lagoons surveyed up to 2006.

Cerastoderma glaucum Bivalve mollusc. A common lagoonal specialist found at 30 of the 87 lagoons (34.5%) surveyed.

Conopeum seurati Bryozoan recorded at 49 of the 87 lagoons surveyed (56.3%), but is not listed in a recent review of Irish marine Bryozoa (Wyse Jackson 1991). Either the species is under-recorded or is truly a lagoonal specialist.

Summary

Lady's Island Lake is an excellent example of a large, **natural sedimentary lagoon** and based on geomorphology alone is one of the largest and best examples of a coastal lagoon in Ireland. The sequence of back-barrier washover and seepage structures are among the best examples in Europe (Orford and Carter 1982). Despite the problems caused by eutrophication, two rare charophytes (*L. papulosum*, *C. canescens*) still survive. The aquatic faunal community during stable periods comprises a characteristic assemblage of brackishwater species, eleven of which are specialist lagoonal species, some of which are rare. Current management practices are controversial and effective solutions to the conflicting interests are subject to financial constraints. Extreme Eutrophication have caused algal blooms, fish kills and severe reduction in benthic vegetation but the lagoon is now being monitored in the hope of improving the situation.

Overall Conservation Value = Moderate

Conservation Status Assessment (from Oliver 2007)

Impacts	Eutrophication from surrounding farmland, farmyards, septic tanks and sewage treatment plant resulting in repeated algal blooms and fishkills. Disturbance from recreational activities. Leisure fishing. Modification of hydrology. Urbanisation. Boating/leisure activities.
Conservation Status	Unfavourable-BAD

Further Information

Previously described faunistically by Healy *et al.* (1982), Galvin (1992), Healy (1997) and floristically by Bates (1977). Geomorphology described by Carter and Orford (1980, 1982), Orford and Carter (1982), Ruz (1989). General description by Hurley (1997, 1998). Surveyed in 1996 for vegetation (Hatch 1996, Hatch & Healy 1998) and in 2003 by Roden (2004). Surveyed in 1996 for aquatic fauna (Healy & Oliver 1996, Oliver & Healy 1998) and ecotonal coleoptera (Good 1996, Good & Butler 1998). Results of these surveys are summarised by Healy *et al.* (1997a,b,c), Healy & Oliver (1998), and Healy (1999, 2003). Included in a biological classification of Irish coastal lagoons (Oliver 2005) and in the Conservation Status Assessment (Oliver 2007).

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