NPWS

Inisheer Island SAC
(site code: 1275)

Conservation objectives supporting document-
Coastal lagoons

Version 1
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Contents

1. Introduction

1.1 Inisheer Island SAC

Inisheer is the smallest of the three Aran Islands, situated approximately 10 km off the west coast of Co. Clare. The island is a geological extension of the karstic Carboniferous region of the Burren.

The SAC is selected for one coastal and one marine habitat listed on Annex I of the Habitats Directive as well as four terrestrial habitats.

"Coastal lagoons" (habitat code 1150) is a priority habitat in Annex I of the 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 such 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 is listed for this SAC (Oliver, 2007). The table below gives the conservation status assessment of this lagoon as outlined in that report. See map in Appendix 1 and Appendix 2 for the account of this site (from Oliver, 2007).

Code[1]	Name	County	Conservation Assessment
IL040	Loch Mor	Galway	Favourable

[1] Codes are those 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 target for habitat area is: stable or increasing, subject to natural processes. Favourable reference area for the mapped lagoon is 6.6ha- see table below.

Code[1]	Name	Area (Ha) [2]
IL040	Loch Mor	6.3

[1] Codes are those used in Oliver, 2007.

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

3. Range

The known distribution of lagoon habitat in Inisheer Island 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 fresh and seawater. Salinity is probably the most important variable in the classification of lagoon types (Roden and Oliver, 2013).

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

The main body of the lagoon has a uniform salinity of 5 psu between 1 and 5m in depth with lower salinity water over parts of the surface (0-3 psu). Seawater enters from a tidal pool to the northeast of the lake from which diluted seawater (up to 20 psu) runs into the lake through limestone fissures. See Roden and Oliver (2013) for further information on salinity classes and Appendix 2 for the lagoon report.

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.

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

An Loch Mor lagoon identified within the Inisheer Island SAC can be classified as very deep. See Appendix 2 for the site report.

4.3 Barrier: connectivity between lagoon and sea

The morphology of the barrier between a lagoon and 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.

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

Seawater enters from a tidal pool to the northeast of the lake through limestone fissures. See also site accounts in Appendix 2.

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: annual median chlorophyll a within natural ranges and less than 5µg/L. Target 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: annual median MRP within natural ranges 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: annual median DIN within natural ranges and less than 0.15mg/L. The target is based on Roden and Oliver (2013).

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

4.7 Depth of macrophyte colonisation

As Loch Mor lagoon has been identified as deep, it is expected that macrophytes extend down to >2m.

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

4.8 Typical plant species

As lagoon specialist species do not easily recolonise, their presence is one of the indicators of long term continuity of quality.

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

The plant species recorded in Loch Mor lagoon is summarised in Oliver (2007). No lagoonal specialists were recorded. See Appendix 2 for individual site report.

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

The species recorded per site are summarised in Oliver (2007). Three lagoonal specialists, the isopod *Jaera nordmanni*, the Heteroptera *Sigara concinna* and the bryozoan *Conopeum seurati* were recorded here. See Appendix 2 for site reports.

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.

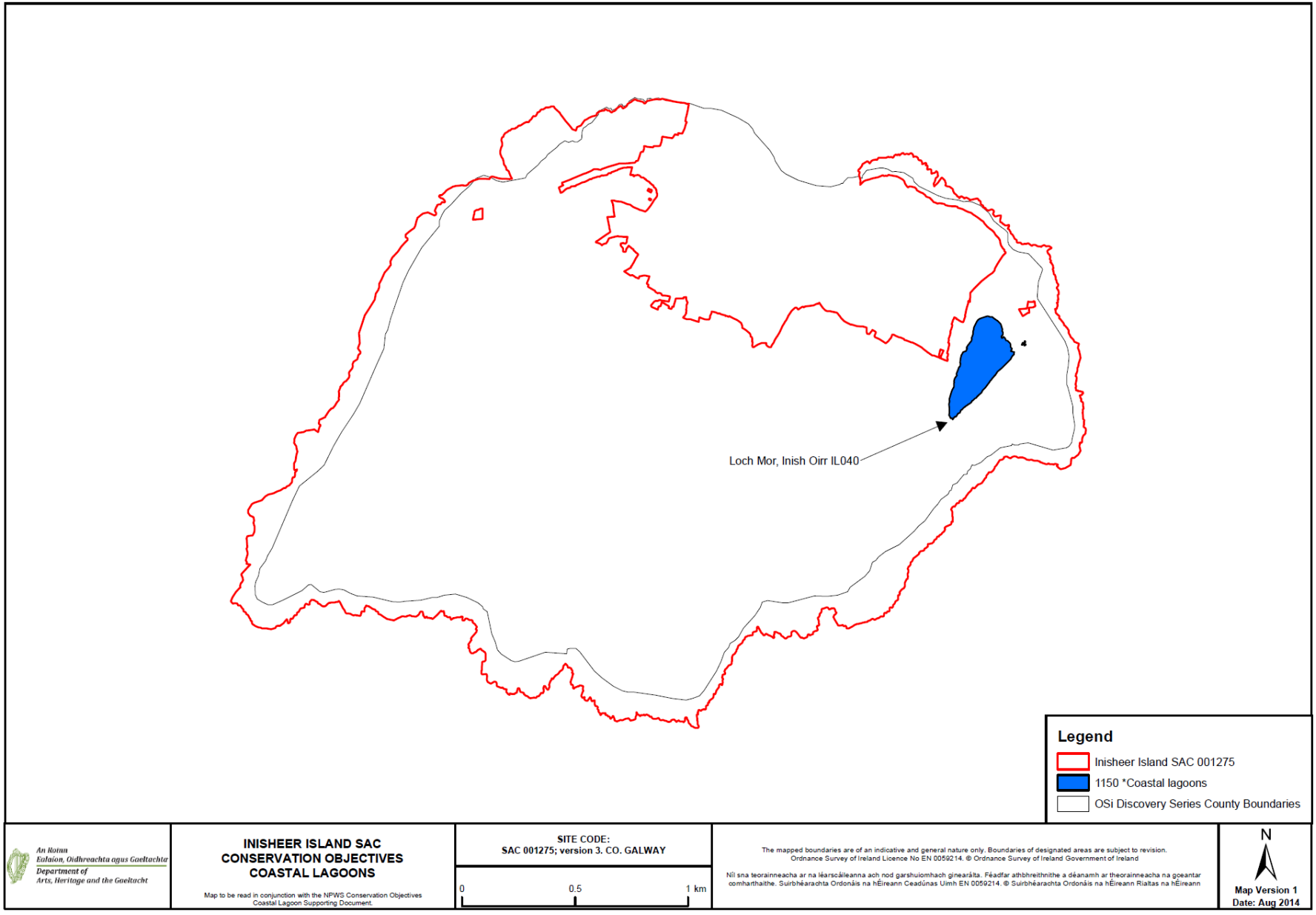
5. References

NPWS (2013) The status of EU protected habitats and species in Ireland. Unpublished report, NPWS. 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 Lagoon distribution map



Appendix 2 Site reports

The following are site accounts from Oliver (2007)

Code[1]	Name
IL040	Loch Mor

[1] Code is that used in Oliver, 2007.

4.40 **Loch Mór, Inish Oírr. County Galway** O.S. L 989 019
O.S. Discovery Sheet 51

Conservation Designation: Inisheer Island SAC 001275, pNHA 001275

General description:

An Loch Mór is situated in the northwest of Inis Oírr, approximately 1 km west of the harbour. The lake is a small (6.6ha), very deep (approx 25m) natural **karst lagoon** with limestone cliffs along much of the shoreline. The main body of the lake has a uniform salinity of 5 psu between 1 and 5 m depth with lower salinity water over parts of the surface (0-3 psu). Seawater enters from a tidal pool to the northeast of the lake from which diluted seawater (up to 20ppt) runs into the lake through limestone fissures. Much of the shoreline and substrate of the shallow parts of the lake are limestone pavement and stones.

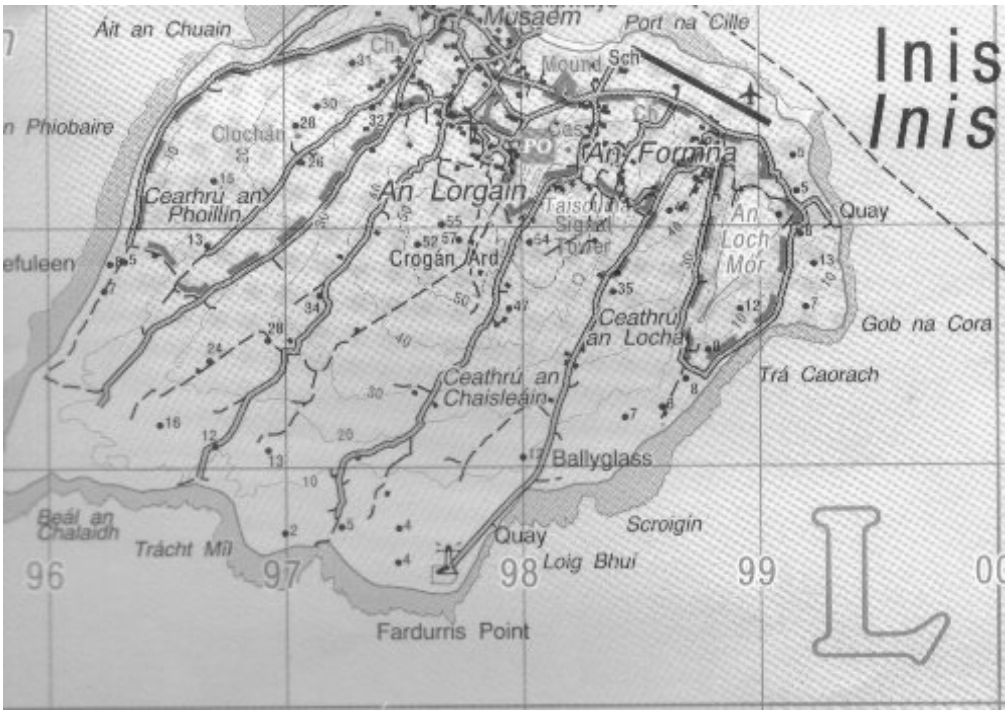


Figure 40.1 Location map of Loch Mór, Inish Oírr.

Loch Mór was surveyed in 1998 for vegetation (Roden 1999), aquatic fauna (Oliver 1999) and ecotonal coleoptera (Good 1998, Good & Butler 2000). Results of these surveys are summarised by Healy (1999a,b; 2003).

Stations used for faunal sampling are not necessarily the same as those used for vegetation or ecotonal coleoptera.

Flora

An Loch Mór was surveyed by C. Roden in 1998 (Roden 1998). Benthic vegetation was extremely uniform consisting of *Enteromorpha* and dense beds of *Potamogeton pectinatus*, below which is a zone of "hard calcareous algal nodules. The turbid water reduces light intensity and bare rock was found below about 5m. Marginal vegetation consists of *Phragmites australis, Schoenoplectus lacustris* and *Scirpus maritimus*. No unusual plants were found, and no lagoonal specialists, and floristically the lagoon was rated of **low conservation value**.
However, following palaeoecological studies by M. O'Connell *et al*. (1997) the site may become of great importance in helping to understand the historical development of saline lakes on the west coast of Ireland.

Fauna

Five stations were selected for faunal sampling in 1998 (Oliver 1998, Healy 1999a,b) (Figure 40.1, Table 40.1).

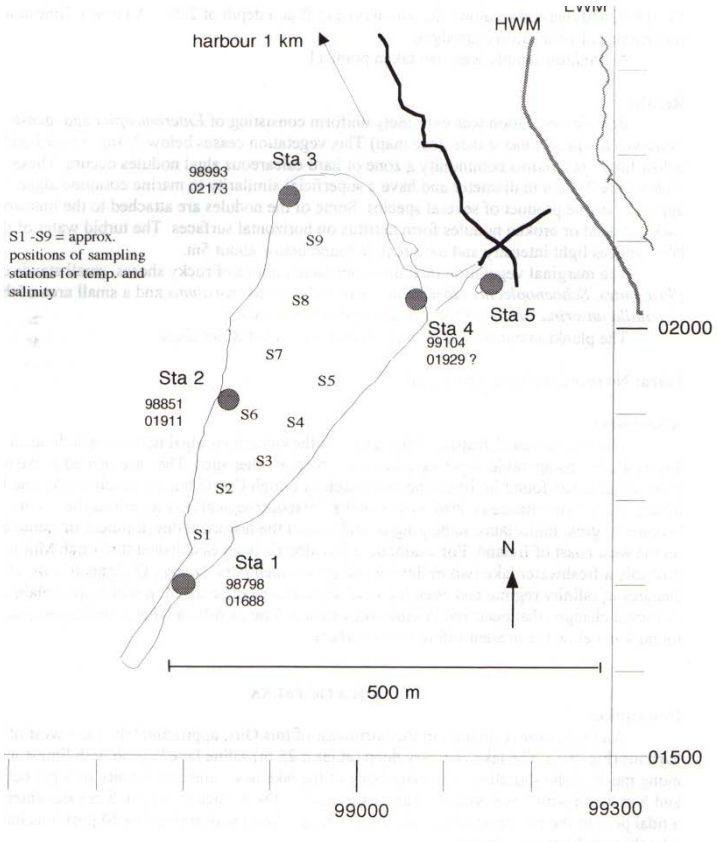


Figure 40.2 Sampling stations used at Loch Mór, Inish Oírr

Table 40.1 Positions of faunal sampling stations in Loch Mór, 24-26/8/98, with salinity, water depth and type of substratum.

	Sta 1	Sta 2	Sta 3	Sta 4	Sta 5
GPS position	L 98798 01688	L 98851 01911	L 98993 02173	L 99104 01929	
Salinity(psu)	2.5-4.9	4.8	4.8	4.7	20
Depth(cm)	0-100	0-100	0-100	0-100	0-200
Substratum	Limestone pavement, rock, silt	Limestone pavement, rock, silt	Limestone pavement.	Limestone pavement, rock.	Limestone pavement, boulders

Remarkably few taxa (15) were recorded in Loch Mór (Table 40.2) and only 10 were identified to species. Two are regarded as lagoonal specialists in Britain, although one (***Sigara concinna***) is of doubtful value as an indicator in Ireland . One species (***Jaera nordmanni***) is a proposed specialist in Ireland.

Table 40.2 Aquatic fauna recorded at stations in An Loch Mór, Inis Oírr, Co. Galway. 1998. F = Fyke net; L.T. = light trap; + = present, o = occasional. c = common, a = abundant. Species in bold text are lagoonal specialists or notable species.

Taxa		Stations								
		1	L.T. 1	2	L.T. 2	3	L.T. 3	4	L.T. 4	5
Turbellaria	*Procerodes littoralis*					c		a	140	
Annelida	*Lumbricillus sp.*									c
Crustacea										
Isopoda	***Jaera nordmanni***	c						c		c
Amphipoda		a	120	a	150	a	120	a	1000	c
	Gammarus duebeni	a	47	a	27		36	a	33	o
Insecta										
Odonata	*Ischnura elegans*			o	1					
Trichoptera	indet.								cases	
Heteroptera	*Corixa panzeri*	a	100	c	60	o	20	o	25	
	Sigara concinna			o	7			o	5	
	Notonecta ?glaucum	o		o	1			o		
Coleoptera	indet.								+	
Diptera	Chironomidae indet					o	4			
Mollusca	*Potamopyrgus antipodarum*	c	1	a	700	c	30	c	21	
	Littorina saxatilis									c
Bryozoa	***Conopeum seurati***							+		
Teleostei	*Anguilla anguilla*							F = 3		

Jaera nordmanni. Isopod crustacean recorded at 24 of the 87 lagoons surveyed (27.6%) and may occur at others where it was not recorded due to the fact that only adult males are easily identified. This species may occur in freshwater, as in L. Errol, Cape Clear, Co. Cork. Described in England (Barnes 1994, Hayward and Ryland 1995) as occurring in streams flowing down the shoreline, on south and west coasts only. All records in Ireland are from West Cork to Donegal. Proposed as a lagoonal specialist for Ireland by Oliver and Healy (1998).

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.

Sigara concinna is listed as a lagoonal specialist in Britain (Barnes 1989, Bamber 1997). It has been recorded in 8 of 87 lagoons (9.2%) in Ireland, surveyed up to 2006, but it is also found at inland sites and appears to be less characteristic of lagoons in Ireland than in Britain.

The fauna of the lagoon is remarkably poor despite the apparently stable and uniform conditions in the lagoon. Presumably this is due to the "island effect" and the problems of colonisation. Based on aquatic fauna, L. Mór is rated as of low **conservation value.**

Ecotonal coleoptera

This site was surveyed for ecotonal coleoptera by Good & Butler in 1998, but none were found after turning over 100 stones. It is therefore rated as of **no conservation value.**

Summary

Both the fauna and flora of the lagoon are poor, although some species are lagoonal specialists and one is potentially interesting and an interesting form of bacterial mat was found by the botanist at depth. However, geomorphologically, the lake is very unusual, and well deserving of protection.

Overall Conservation Value = Moderate

Conservation Status Assessment (from Oliver 2007)	
Impacts	Natural deep lagoon. Stratified.
Conservation Status	Favourable

Further Information

Palaeoecological studies have been carried out by N.U.I.G. (O'Connell *et al.*1997) Listed as a lagoon by Healy *et al.* 1997. Surveyed in 1998 for vegetation (Roden 1999), aquatic fauna (Oliver 1999) and ecotonal coleoptera (Good 1998, Good & Butler 2000). Results of these surveys are summarised by Healy (1999a,b; 2003). Included in a biological classification of Irish coastal lagoons (Oliver 2005) and in the Conservation Status Assessment (Oliver 2007).

References:

Bamber, R.N. 1997. Assessment of saline lagoons within Special Areas of Conservation. *English Nature Research Reports* No. 235.

Barnes, R.S.K. 1989. Coastal lagoons of Britain: an overview and conservation appraisal. *Biological Conservation 49***:** 295–313.

Barnes, R.S.K. 1994. *The brackish-water fauna of northwestern Europe: a guide to brackish-water habitats, ecology and macrofauna for field workers, naturalists and students.* Cambridge University Press. 287 pp.

Good, J.A. 1999. A survey of *Irish coastal lagoons. Vol V. Ecotonal Coleoptera (Staphylinidae and Carabidae).* Dúchas, Dublin.

Good, J.A. & Butler, F.T. 2000. Coastal lagoon and saline lake shores as a habitat for Staphylinidae, Carabidae and Pselaphidae (Coleoptera) in Ireland. Part 2. *Bulletin of the Irish Biogeographical Society*. **24:** 111-41

Healy, B. 1999a. *Survey of Irish coastal lagoons. 1996 and 1998. Vol. 1 Part 1. Background, description and summary of the surveys*. Dúchas, Dublin.

Healy, B. 1999b. *Survey of Irish coastal lagoons. 1996 and 1998. Vol. 1 Part 2. Lagoons surveyed in 1998*. Dúchas, Dublin.

Healy, B. 2003. Coastal Lagoons. In: *Wetlands of Ireland.* R. Otte (ed). Chapter 4. University College Dublin Press. Dublin. 44-78.

Healy, B. & Oliver, G.A. 1998. Irish coastal lagoons: summary of a survey. *Bulletin of the Irish Biogeographical Society.* **21:** 116-50.

Healy, B., Oliver, G.A., Hatch, P. & Good, J.A. 1997. *Coastal lagoons in the Republic of Ireland. Vol. 3. Inventory of lagoons and saline lakes.* Report to the National Parks and Wildlife Service, Dublin.

O'Connell, M., Molloy, K., Usinger, H. & Dorfler, W. 1997. Coring deep calcareous lakes in S.E. Clare and Inis Oírr (Inisheer) western Ireland, towards the reconstruction of late Glacial and Holocene environments. *Wurzburger Geographische Manuskripte,* **41.**

Oliver, G.A. 1999. *A survey of Irish coastal lagoons. Vol. IV: Aquatic Fauna.* Unpublished report for Dúchas, The Heritage Service. Dublin.

Oliver, G.A. 2005. *Seasonal changes and Biological Classification of Irish Coastal Lagoons.* PhD Thesis. U.C.D., Dublin. Available on www.irishlagoons.com

Oliver, G.A. 2007. *Conservation status report: Coastal Lagoons (1150).* Unpublished report to the National Parks and Wildlife Service, Dublin.

Oliver, G.A. and Healy, B. 1998 Records of aquatic fauna from coastal lagoons in Ireland. *Bulletin of the Irish Biogeographical Society*. **21**: 66-115.

Roden, C. 1999. *Irish coastal lagoon survey, 1998. Vol. III, Flora.* Dúchas, Dublin.

Wyse Jackson, P.N. 1991. Distribution of Irish marine Bryozoa, together with biographical notes relating to the chief researchers in the group. *Bulletin of the Irish Biogeographical Society.* **14:** 129-18.