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Castle Enigan ASSI

Condition Assessment Report
Invertebrate Assemblage
2024

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Gníomhaireacht de chuid na Roinne Talmhaíochta, Comhshaoil agus Gnóthaí Tuaithe

An Agency wi'in the Depairtment o Fairmin, Environment an' Kintra Matthers

Castle Enigan ASSI Condition Assessment Report Terrestrial Invertebrates 2024

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Acknowledgements

The continued stewardship of the special lands within the ASSI, and access permission to undertake monitoring, is acknowledged. Many protected areas in Northern Ireland are owned and managed by private landowners and farmers and are not accessible to the public.

Summary

Using JNCC Common Standards Monitoring methodology, the Terrestrial Invertebrate features of Castle Enigan ASSI are currently defined as follows:

1. Natural minerotrophic fens assemblage - **Unfavourable**

The natural minerotrophic fen assemblage was assessed as unfavourable as there was poor representation of the water beetle assemblage associated with this habitat (33%). The 2024 data indicates a decline in species diversity from 56% of the target water beetles found in 2007.

Furthermore, only two of the eleven additional target invertebrate species were recorded. The rare species of money spider *Carorita limnaea* (family Linyphiidae) was recorded from a pitfall trap at Castle Enigan and this species shall be added as a future target for the natural minerotrophic fen assemblage.

The habitat appeared relatively unchanged from the previous assessment across most of the site – it was moss-dominated and water appeared with treading; however species were difficult to find. Water quality did not appear to have declined significantly, although there was a persistent smell of slurry near to the access road.

Overall, Castle Enigan ASSI retains some of its diversity and naturalness, and remains a special place.

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1. Condition Statement

The interest features of Castle Enigan and their condition status are summarised in Table 1 below.

It is important to note that under the Common Standards Monitoring methodology, a site is classified as unfavourable if any primary attribute is failing. In many cases, these sites continue to represent excellent examples of Northern Ireland's best natural assets.

This report deals solely with the features listed in Table 1. The site contains other features of interest including Fens.

Table 1: Castle Enigan ASSI Interest Features summary results

ASSI Features	Reporting responsibility	Condition Assessment			
		2002-2007	2008-2013	2014-2019	2020-2025
Natural Minerotrophic Fens Invertebrate Assemblage	Species - Invertebrate	Favourable 3 favourable attributes 0 unfavourable attributes	Not assessed	Not assessed	Unfavourable

*More detailed information on attribute breakdown is available in Section 7 and Appendix 1 of this report.

Background

The Department of Agriculture, Environment and Rural Affairs (hereafter referred to as the Department) in its role as the Statutory Nature Conservation Body, undertakes regular monitoring of the special assets, or features, contained within specially protected sites across Northern Ireland. These sites include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Areas of Special Scientific Interest (ASSIs). Further details can be found at https://www.daerani.gov.uk/topics/protected-areas.

This monitoring enables reporting on the status of the special features which are protected, enables objective feedback on current management measures and can inform any subsequent management intentions. Results can also contribute to the assessment of relevant policies in place, and also inform future policy development. In addition, the results inform the implementation of a range of obligations under both national and international policy and legislation. These include: the Convention on Biological Diversity (CBD), the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), the Bern Convention, the Marine Strategy Framework Directive (MSFD), and the Water Framework Directive (WFD).

The monitoring undertaken is called Condition Assessment, as it is the condition of the special features that is being assessed. The approach is also known as Common Standards Monitoring, because the methodology aims to result in a *common standard* being reported across sites in NI and the rest of the UK. The Department aims to complete a rolling programme of ASSI Condition Assessment and reporting every six years.

The monitoring is focused, as outlined in the Joint Nature Conservation Committee (JNCC) guidance (JNCC, 2004a), primarily on the interest features for which the site has been notified or designated. They include habitat types, species and earth science features, as well as complex features such as habitat mosaics and species assemblages. Each interest feature must be identified, monitored, assessed and reported upon separately.

Monitoring and assessment of the condition of the interest features of individual sites enables relevant authorities, agencies and landowners to adapt management measures accordingly to ensure conservation objectives are achieved.

The Conservation Objectives for each site contain details of the attributes (measurable targets) for each interest feature within the site: the condition assessment determines the condition status of each interest feature when compared against relevant feature attributes.

The JNCC Statement on Common Standards Monitoring (JNCC, 2019) assesses interest features using one of the following four condition categories. These are all common standards:

- **Favourable**: Condition objectives are being met
- **Unfavourable**: Condition objectives are not being met
- **Partially destroyed**: The feature, habitat or processes essential to support it have been removed or irretrievably altered. A condition assessment should be carried out on the remaining, intact feature.
- **Destroyed**: The interest feature, its supporting habitat or processes, have been affected (completely or partially) to such an extent that there is no hope of recovery.

The JNCC has listed the following trend qualifiers which were previously considered part of the common standards as optional, which the Department may choose to use as required:

- **Favourable – maintained**: The conservation objectives which were met at the previous assessment are still being met.
- **Favourable – recovered**: The interest feature has gained favourable condition, having been previously recorded as unfavourable.
- **Favourable – declining**: All targets are being met, but identified pressures indicate that unfavourable condition will result if these pressures are left unaddressed.
- **Unfavourable – recovering:** The interest feature has begun to show, or is continuing to show, a trend towards favourable condition.
- **Unfavourable - no change**. The interest feature is unfavourable but neither declining nor recovering.
- **Unfavourable - declining**. The interest feature is declining as a consequence of damaging activity, but where recovery is possible, either spontaneously or if suitable management input is made.

2. ASSI Overview

Castle Enigan is a diverse site of over 23 hectares located five kilometres to the north-east of Newry. It comprises an extensive inter-drumlin basin with a wide range of wetland communities lying between ridges of higher ground. These raised areas support a range of habitats including wet heath, acid grasslands, scrub and wood which add considerable diversity to the site. Much of the fen has developed on cut-over bog and some deep pools still remain. The vegetation is characterised by bottle sedge and water horsetail with associated herbs and grasses.

Many protected areas in Northern Ireland are owned and managed by private landowners and farmers and are not accessible to the public.

Table 2: ASSI details

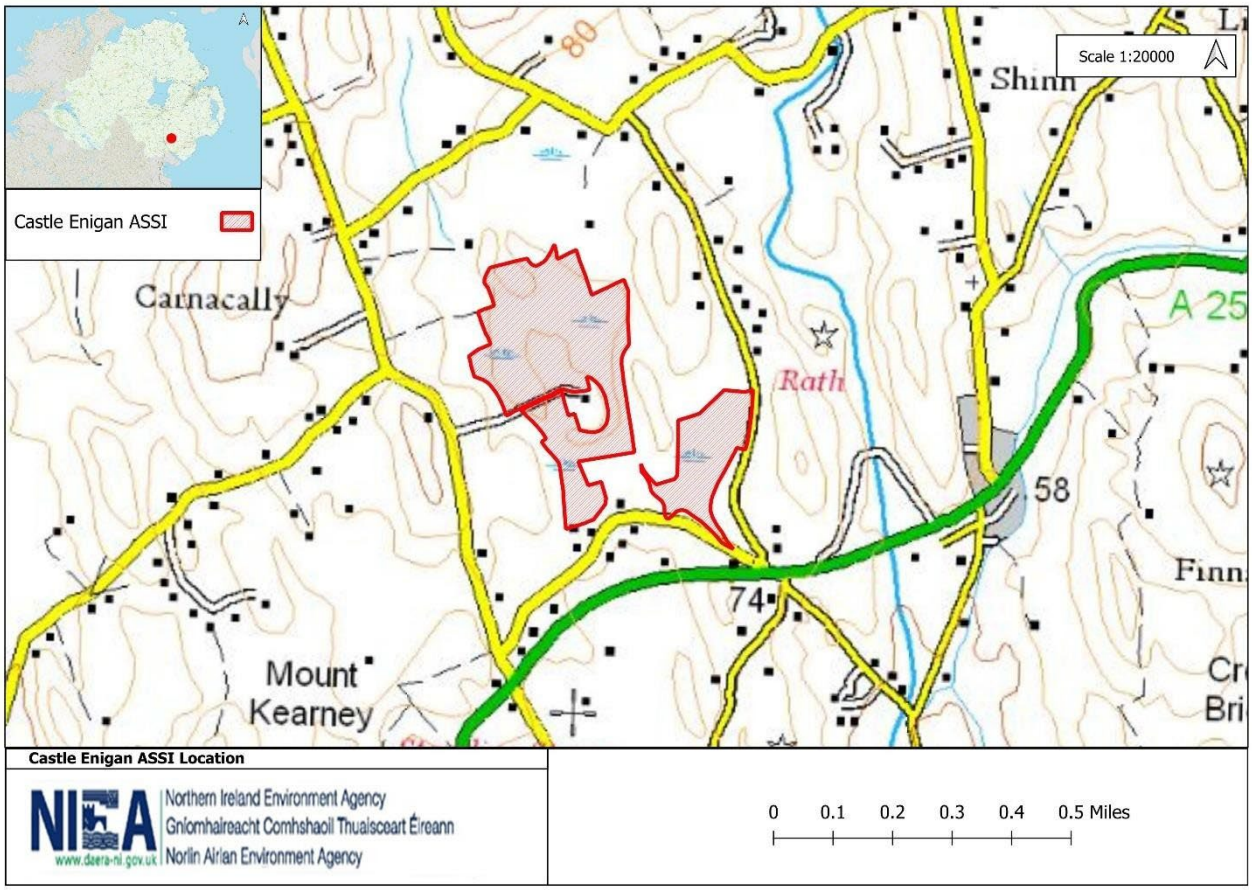
ASSI name	Castle Enigan
ASSI code	ASSI 157
Council Area (s)	Newry, Mourne and Down District Council
Irish Grid Reference	J 121 322
Landowner details	Ten private owners
ASSI size	23.35 ha
Date declared	16/02/1998

Further information on Castle Enigan ASSI is available via:

- DAERA website;
- NIEA map viewer;
- NBN (National Biodiversity Network) Atlas NI

3. Location map

Map 1 – Castle Enigan ASSI boundary and Northern Ireland location



4. Feature description

Aquatic beetles represent a key component of the invertebrate fauna at many wetland sites and following the evaluation in the 2007 Common Standards Monitoring (Foster et al 1992) one key assemblage group was identified for Castle Enigan. In addition to the water beetle group a second attribute comprising additional target species has been identified for the feature. In each case the presence of a percentage of the target species is required to confirm an attribute as being in favourable condition.

Natural Minerotrophic Fen Assemblage

The water beetle community at Castle Enigan was found to correspond to Group G, comprising 45 species which typically occur in natural fen habitats (Appendix 7). In 2007 a target of at least 50% of these species was set as the requirement for favourable status.

Eleven additional target species from a wider range of invertebrate taxa were also identified as target species and these comprise another attribute of this feature. Recording of at least 50% of these targets denotes favourable condition for the attribute. A further target species was identified during fieldwork in 2024 (see below). A key target is the Horsetail Sloth Weevil *Bagous lutulentus,* a rare NI

priority species which is listed as Critically Endangered in (CR) in Ireland Red List No. 1 – Water Beetles.

The eleven target species are

- *Bagous lutulentus* (Coleoptera: Dytiscidae) – a NI priority species
- *Hebrus ruficeps* (Hemiptera: Hebridae)
- *Pirata piscatorius* (Araneae: Lycosidae)
- *Salda morio/muelleri* (Hemiptera: Saldidae)
- *Blethisa multipunctate* (Coleoptera: Carabidae)
- *Gerris lateralis* (Hemiptera: Gerridae)
- *Rhantus grapii* (Coleoptera: Dytiscidae)
- *Hydaticus seminiger* (Coleoptera: Dytiscidae)
- *Cercyon ustulatus* (Coleoptera: Hydrophilidae)
- *Lamproplax picea* (Hemiptera: Rhyparochromidae)
- *Scolopostethus puberulus* (Hemiptera: Rhyparochromidae)

One new target species has been added as a result of the monitoring effort in 2024.

- *Carorita limnaea* (Araneae: Linyphiidae) – a NI Priority Species

Good quality ground water is a critical factor for this habitat, and this is the primary indirect attribute for this feature. Scientific monitoring of the water quality is desirable although it can be rapidly assessed by eye - it should appear clear without suspended silt.

Vegetation structure of fens is also crucial, which ideally should be short fen with wet moss carpets. As in 2007, this was not formally assessed since this attribute should be quantifiably measured using aerial images and habitat mapping.

5. Common Standards Monitoring Methodology

The condition of the terrestrial invertebrate features of Castle Enigan ASSI has been assessed following the Common Standards Monitoring (CSM) guidance Common Standards Monitoring guidance | JNCC - Adviser to Government on Nature Conservation for invertebrates.

The attributes to be measured are dependent on the specific interest features and are derived from a combination of direct and indirect attributes from the tables in the CSM guidance.

Site specific methodology

The assessment was undertaken by Allen and Mellon Environmental on behalf of DAERA between May and August 2024. The condition assessment of the invertebrate species feature(s) was undertaken by recording a number of key feature attributes at a series of pre-determined sites based on previous condition assessment work undertaken in 2007. Standard entomological survey techniques were utilised during the survey, with specific reference to Natural England Research Report NERR005.

The primary sampling method for the Natural Minerotrophic Fen feature was the installation of five pit-fall traps between 7th May and 3rd June 2024. The pit-fall locations were as close as possible to the 2007 sites as illustrated in Map 2 (Appendix 2). The pit-fall co-ordinates are provided as target notes in Appendix 3. Pit-fall trap specimens were identified in the laboratory. Pond-netting was also carried out at two locations where deeper pools were present within the fen habitat.

6. Results

At Castle Enigan ASSI, one invertebrate feature was assessed against targets. The detailed condition assessment attributes are displayed in the Appendix 1 - Attribute Table where they are measured against set condition assessment targets.

Natural Minerotrophic Fen Assemblage

Table 2: Summary table of all attributes assessed against set criteria

2 Direct Attributes assessed	0 Favourable
	2 Unfavourable
3 Indirect Attributes assessed	3 Favourable
	0 Unfavourable

Castle Enigan ASSI natural minerotrophic fen invertebrate feature has 3 attributes in favourable condition and 2 attributes in unfavourable condition. Therefore, this ASSI feature is in **unfavourable** condition. See discussion for full details on reasoning.

7. Discussion

The 2024 monitoring results suggest a significant decline in the invertebrate fauna at this site.

Natural minerotrophic fens assemblage

In 2007 56% of the Group G water beetles were recorded and against a target of >50% representation. In 2024 this declined to 33% with 15 of the 45 potential species recorded, leading to the unfavourable condition assessment.

The second attribute for the fen assemblage (presence of other invertebrates) was also assessed as unfavourable, since only two of the eleven original target species were found – the wolf spider *Pirata piscatorius* and the true bug *Hebrus ruficeps.* An additional target species was added – the money spider *Carorita limnaea* a rare species of semi-natural grassland, bog margins and marshes which is listed as a NI Priority Species. However since only 25% of the listed targets were recorded the assessment was still unfavourable.

A full list of the species recorded on site can be found in Appendix 6.

Indirect attributes for this assemblage have been aligned with the condition assessment for the fen habitat feature. Attributes are included under the headings of fen extent, fen hydrology and vegetation structure. Whilst visual assessments were made during invertebrate monitoring, the condition assessment recognises that more detailed monitoring was undertaken during the most recent habitat assessment (2021).

The water quality appeared from visual inspection to be good, although an important caveat is that a persistent smell of slurry was evident in parts of the site near to the access road. This is an indication that the site is extremely vulnerable to the effects of agricultural run-off.

Vegetation structure of fens is also crucial, and ideally this should be a short, grazed sward with wet moss carpets. The visual impression was that the fen's vegetation structure was similar to the previous survey with a varied sward and signs of light grazing and could therefore be considered favourable in the context of the invertebrate assemblage.

8. Feature Recommendations

- The continuation and management of grazing in the fen areas is essential to maintain the fen habitat and its invertebrate assemblage. Where grazing is not possible, hand-cutting or mowing of encroaching vegetation should be considered.
- Buffer zones where slurry spreading is not permitted should be established and implemented in all agricultural land surrounding the site.

9. References

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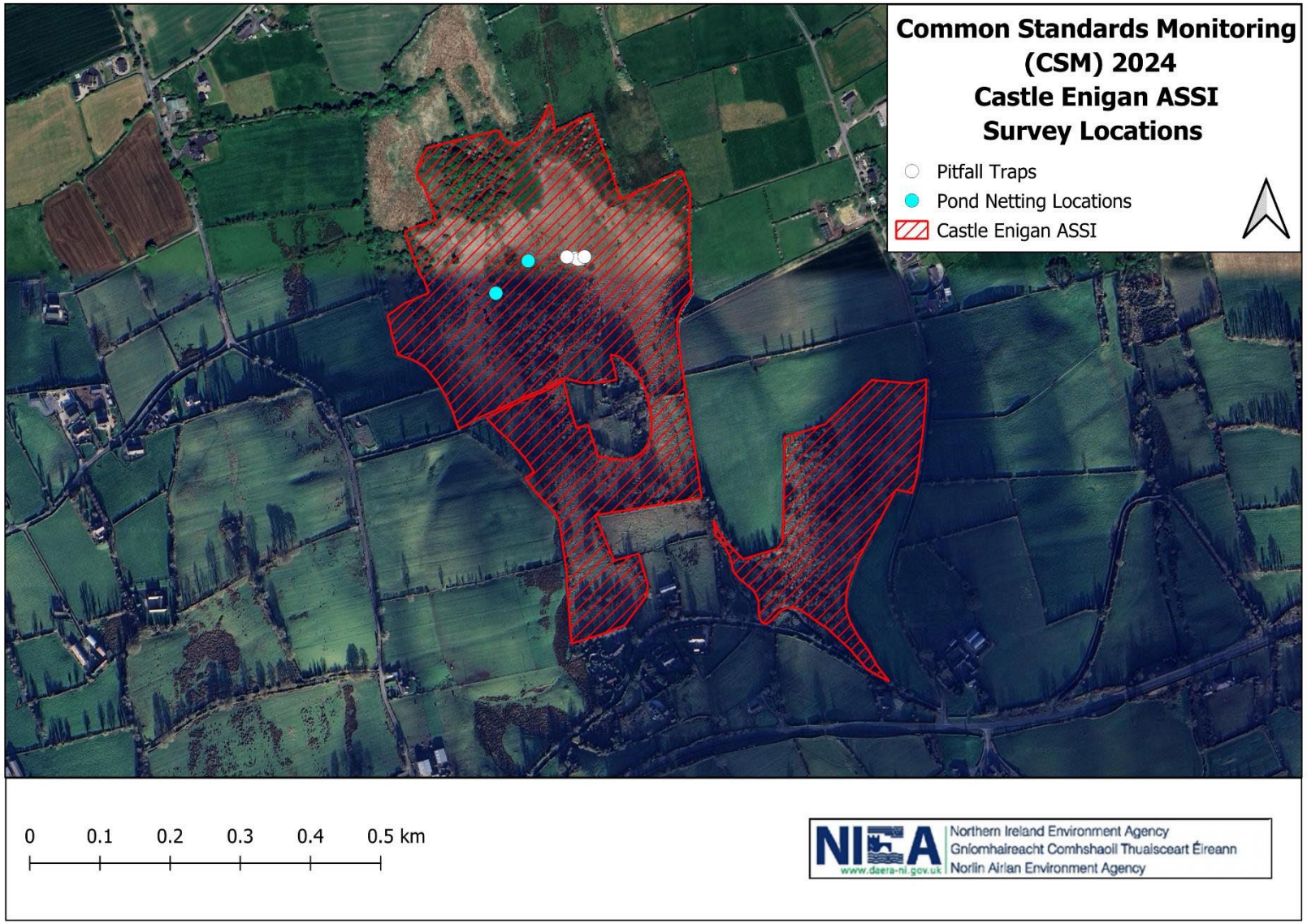
10. Appendix 1 Attribute tables

Table 3: Natural Minerotrophic Fens Invertebrate Assemblage Attribute Table

Attribute	Target	Method of Assessment	Monitoring Results 2024	Assessment	Monitoring Cycle Results 2014-19	Monitoring Cycle Results 2008-13
Direct Attributes						
Presence of Water Beetle Assemblage (Group G)	Water beetles: ≥50% representation of species in Group G	Pit-fall trapping Hand-searching, sweep-netting and pond-netting.	Only 15 species were recorded (Appendix 7), representing 33% of the species associated with this assemblage (Appendix 8).	Unfavourable	Not Assessed	Favourable
Presence of Additional Invertebrate Species	≥50% of target species including the priority target Order Coleoptera: *Bagous lutulentus* (family Curculionidae)	Pit-fall trapping Hand-searching, sweep-netting and pond-netting.	Three species were recorded including the new target *Carorita limnaea* The only other species recorded were the Wolf Spider *Pirata piscatorius* and the true bug	Unfavourable	Not Assessed	Favourable
Indirect Attributes						
Fen extent	Maintain extent of fen present at declaration	Visual assessment	No evidence of loss of fen habitat	Favourable	Not Assessed	Favourable
Fen hydrology	Maintain overall wetness. Clear water with no suspended silt	Visual assessment / foot testing	No change in wetness detected in the area surveyed. No suspended solids noted. However there was a persistent smell of slurry during the visit	Favourable	Not Assessed	Favourable
Vegetation structure	. No decrease in area of short fen vegetation No increase in vegetation height or decrease in naturally occurring bare ground	Visual assessment	The visual impression was that the fen's vegetation structure was similar to the previous survey a with a varied sward and signs of light grazing and could therefore be considered favourable in the context of the invertebrate assemblage	Favourable	Not Assessed	Not Assessed

11. Appendix 2 Maps

Map 2: Castle Enigan ASSI Sampling Locations


Common Standards Monitoring
(CSM) 2024
Castle Enigan ASSI
Survey Locations
Pitfall Traps
Pond Netting Locations
Castle Enigan ASSI
0
0.1
0.2
0.3
0.4
0.5 km
NIEA
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Norlin Airlan Environment Agency

12. Appendix 3 Target Notes

Table 4: Location of pit-fall traps

Pit-fall Number	Co-ordinates
1	J1211932251
2	J1211632251
3	J1211232253
4	J1212532255
5	J1210032254

13. Appendix 4 – Photographs



Photo; (A) Pitfall trap 1, (B) Pitfall trap 2, (C) line of pitfall traps starting with pitfall trap 4 in the foreground and pitfall traps 3 and 2 in the background,15 (D) chicken wire over pitfall trap to prevent unwanted bycatch such as frogs and newts, (E) area of grassland and scrub with devils bit scabious and (F) some trampling of vegetation near entrance.

14. Appendix 5 – Survey dates

Table 7: Survey dates and locations monitored

Survey dates	Survey Staff	Total	Locations Monitored	Weather Conditions
07/05/2024	Anna Hart, Brian Nelson	0.5	Castle Enigan ASSI	Warm and slightly overcast
03/06/2024	Anna Hart, Brian Nelson	0.5	Castle Enigan ASSI	Cool and overcast
01/08/2024	Anna Hart, Brian Nelson	2	Castle Enigan ASSI	Warm and slightly overcast

15. Appendix 6 – Species List

Species	Status
Agabus affinis	Water Beetle Group G Target
Anacaena globulus	Water Beetle Group G Target
Anacaena limbata	Water Beetle Group G Target
Bathyphantes gracilis	
Bathyphantes parvulus	
Brachygluta fossulata	
Carorita limnaea	Target Species – NI Priority Species
Cercyon convexiusculus	Water Beetle Group G Target
Chartoscirta cincta	
Boreoclytocerus ocellaris	
Coccidula rufa	
Coelostoma orbiculare	Water Beetle Group G Target
Cyphon padi	
Cyphon variabilis	
Cytilus sericeus	
Dixella aestivalis	
Enochrus coarctatus	Water Beetle Group G Target
Erigonella hiemalis	
Erioconopa diuturna	
Fagniezia impressa	
Galerucella nymphaeae	
Hebrus ruficeps	Target Species

Helophorus brevipalpis	Water Beetle Group G Target
Hydrobius fuscipes sens. str.	Water Beetle Group G Target
Hydroporus erythrocephalus	Water Beetle Group G Target
Hydroporus palustris	Water Beetle Group G Target
Hydroporus planus	Water Beetle Group G Target

Species	**Status**
Hydroporus scalesianus	Water Beetle Group G Target
Hydroporus umbrosus	Water Beetle Group G Target
Ilybius guttiger	Water Beetle Group G Target
Ilybius quadriguttatus	Water Beetle Group G Target
Kaestneria pullata	
Lesteva sicula	
Myrmedobia exilis	
Myrmica ruginodis	
Nabis flavomarginatus	
Nemastoma bimaculatum	
Nepa cinerea	
Oedothorax gibbosus	
Oxypoda elongatula	
Ozyptila trux	
Pachybrachius fracticollis	
Paederus fuscipes	
Paederus riparius	
Pardosa nigriceps	

Pardosa pullata	
Peponocranium ludicrum	
Phyllotreta exclamationis	
Piezodorus lituratus	
Pirata piraticus	
Pirata piscatorius	Target Species
Plagiognathus chrysanthemi	
Pocadicnemis pumila sens. str.	
Quedius fuliginosus	
Silometopus elegans	
Stenodema laevigata	
Species	**Status**
Stygnocoris sabulosus	
Teratocoris saundersi	
Tetartopeus terminatus	
Xysticus cristatus	
Zyras collaris	

16. Appendix 7 – Water Beetle Assemblage Analysis

Foster et al. (1992) analysed 289 site lists of water beetle from Irish wetlands using TWINSPAN, a form of multivariate analysis. The analysis included lists from some of the ASSIs targeted in the 2007-2008 Invertebrate Condition Site Monitoring. Ten assemblage types were identified which were associated with broad habitat types (these are summarised below). These reference assemblages were used to evaluate the site lists produced from 28 wetland sites surveyed in 2007. Habitat names are attached to these assemblages to help the user to recognise a typical situation in which each assemblage might occur: it is perfectly feasible for a single site to support a range of assemblages.

The analysis in Foster et al. (1992) provided an objective standard for evaluating water beetle assemblages in future cycles of Condition Site Monitoring. Ideally habitat conditions through the next monitoring cycle will be maintained close to their current state. The water beetle assemblages should also show high correspondence with the reference species list when similar sampling protocols have been followed. Significant changes from the reference assemblage will suggest that significant habitat change has occurred on the ASSI.

Complete site lists were constructed from the 2007/2008 data. These were then compared with the species lists for the assemblages given in Table 4 of Foster et al. (1992) (reproduced below). This table covers only the species which occur in 20% or more of the site lists originally used to characterise each assemblage type. Rarer species may be associated closely with particular assemblages. Presence of these species may assist in determining the reference state of the ASSI. The species occurrences in each of the end-groups are expressed as percentages. These are provided in a table included with the ASSI site report. A target of 50% representation of the species listed for the reference assemblage was set for favourable status. In a few instances the target was lowered.

The appropriate reference assemblages for each ASSI were determined from the habitat conditions apparent on the site, reading the site description and interpretation of the species lists. Several of the sites were included in the original analysis and so at least one assemblage for these sites were predetermined. These are indicated in the list below. The majority of the wetland sites supported two reference assemblages, an open water assemblage (either E or D) and a mire assemblage (one of G, H or I). Most of the sites sampled are described as lowland fen habitat and the natural minerotrophic assemblage (group G) was the appropriate reference state for them. Many of these fens are associated with small permanent open waters and the ponds and ditches assemblage (group E) is the appropriate reference assemblage in the majority of sites. In some cases the sites were clearly secondary fens developed on cutover bogs and for these the reference state is the base-flushed cutover bog assemblage (group H). A small number of sites are referenced to the acid mire/peat bog assemblage (group I).

It is recognised that this is open to interpretation as differences between the habitats can be subtle or differently interpreted. It should be stressed that a high score in the analysis does not mean that the assemblage is present on the site. Many of the water beetle species occur in more than one assemblage so samples can produce false positives. The detection of rare species assisted in detecting these false positives.

Table 4 from Foster et al. (1992).
Occurrences of water beetles in ten community types recognized by application of TWINSPAN to Irish water beetle site data.
The percentage occurrences are given as those of 20% or more. Species names have been updated to correspond to modern nomenclature; the old name is shown in brackets where appropriate.

Species	A	B	C	D	E	F	G	H	I	J
	19	21	16	15	20	34	45	52	11	14
Brychius elevatus	56									
Haliplus fluviatilis	44									
Nebrioporus =(Potamonectes) depressus	75									
Stictotarsus duodecimpustulatus	38	20								
Oreodytes sanmarkii		80								
Oreodytes septentrionalis		30								
Orectochilus villosus	31									
Hydraena gracilis		40								
Elmis aenea	63	70								
Esolus parallelepipedus		20								
Limnius volckmari	25	40								
Oulimnius tuberculatus	25	40								
Laccobius ytenensis = atrocephalus		20								
Haliplus sibiricus = Haliplus wehnckei	56			21						
Laccobius striatulus	31									
Haliplus lineatocollis	44	40	38			26				
Agabus paludosus			31							
Helophorus brevipalpis	88	100	96	47	69	82	69	58		44

Haliplus obliquus						29				
Graptodytes bilineatus						26				
Agabus labiatus						26				
Hygrotus (Coelambus) impressopunctatus						21				
Agabus nebulosus						62				
Hygrotus quinquelineatus				36		56				
Laccobius minutus						21				
Helophorus grandis	50		27			41	35			
Laccophilus minutus				29		59		21		
Porhydrus lineatus				28		38				
Ilybius fuliginosus	44		50	43	61	79	35	26		
Helophorus minutus						41				
Laccobius colon						21				
Ochthebius minimus						38				
Hygrotus inaequalis				47	63	50	31	26		

Species	A	B	C	D	E	F	G	H	I	J
	19	21	16	15	20	34	45	52	11	14
Hyphydrus ovatus				45				37		
Nebrioporus (Potamonectes) assimilis				24						
Gyrinus marinus				33						
Rhantus frontalis						26				
Colymbetes fuscus					41	56	31	21		
Noterus clavicornis				40				37		
Haliplus ruficollis				38	39	47	27	53		
Hydroporus palustris	44		31	64	59	74	54	74		
Rhantus exsoletus				52	28	35		53		

Dytiscus marginalis							38	32		
Gyrinus substriatus	44		23	45	33	24		63	62	
Enochrus testaceus								21		
Agabus sturmii					38		50	53		
Ilybius ater					34	32	42	42		
Anacaena lutescens						32		53		
Laccobius bipunctatus					22		27			
Hydroporus planus			38		38	68	54	47		
Agabus bipustulatus		30	77		73	76	92	74	67	88
Hydroporus tessellatus	44	30	42		50	21	42	37		
Helophorus aequalis		30	62		41	41	42	42		31
Agabus guttatus		30								
Limnebius truncatellus	44	80	27				27	21		
Hydraena riparia	31						27			
Dryops luridus		30				24		32		
Helophorus flavipes		30	46					32	29	75
Anacaena globulus		100	65		31		69	74		88
Hydroporus pubescens		30	58		36	59	62	74	71	69
Ilybius montanus = Agabus melanocornis								21		
Hydroporus incognitus		20								
Hydroporus erythrocephalus					27	21	65	74	52	
Stictonectes lepidus								26		
Hydrobius fuscipes					32	35	65	74		25
Hydroporus striola						29	73	47		
Anacaena limbata							50			
Ilybius quadriguttatus					20		73	37		
Hydroporus memnonius							54	37		25

Hydroporus nigrita			23				42			31
Species	A	B	C	D	E	F	G	H	I	J
	19	21	16	15	20	34	45	52	11	14
Suphrodytes dorsalis							38	42		
Hydaticus seminiger							27	26		
Acilius canaliculatus								21		
Gyrinus natator								42		
Liopterus (Copelatus) haemorrhoidalis							31			
Enochrus coarctatus							62	63		
Chaetarthria seminulum sensu lato							35	21		
Hydroporus glabriusculus							27			
Hydroporus scalesianus							35			
Laccornis oblongus							27			
Cercyon convexiusculus							31			
Cymbiodyta marginellus							27			
Hydroporus angustatus							73	47		
Agabus affinis							50	68		
Rhantus grapii							27	26		
Hydroporus umbrosus							42	58		
Graptodytes granularis							31	21		
Agabus unguicularis							38	32		
Ilybius guttiger							42	47		
Coelostoma orbiculare							46	53		
Hydroporus gyllenhalii							38	68	48	56
Hydroporus obscurus								47	76	56
Hydroporus tristis								42	62	38
Enochrus affinis									38	

Enochrus fuscipennis								21		31
Hydroporus longulus										25
Ilybius aenescens								21	29	
Gyrinus minutus								42	29	

Description of the 10 water beetle assemblages in the classification of Foster *et al.* (1992)

The ten community types may be generally described in terms of sites, habitats and species as follows:

A. Deep rivers, including one lake with species found on wave-washed shores, as well as in running water.

B. Rivers with riffle sections and beds of unstable shingle.

C. Water dominated by the non-specialist fauna usually considered typical of puddles, but with species of seepage *(Agabus paludosus).*

D. Permanent stagnant open water sites with rich vegetation, usually considered to be eutrophic or enriched.

E. Small but stagnant water bodies, such as ponds, ditches, and isolated pockets of water within the vegetated edges of enriched lakes'. The fauna included species apparently able to survive periods of drought whereas the similar fauna of Group D included species associated with permanently flooded sites, e.g. *Noterus clavicornis, Hyphydrus ovatus, Hygrotus quinquelineatus* and *Potamonectes assimilis.*

F. Turloughs and more permanent, large, shallow water bodies on base-rich substrata.

G. This natural fen community was characterized by small dytiscid species rarely found in other habitats: *Hydroporus glabriusculus, H. scalesianus, Laccornis oblongus* and *Copelatus haemorrhoidalis.*

H. This group was clearly related to Group G but distinguished from it by the additional presence of species generally considered to be acidophilic, i.e. *Hydroporus gyllenhalii, H. tristis, Ilybius aenescens* and *Gyrinus minutus,* as well as some species usually regarded as indicators of eutrophic conditions, e.g. *Noterus clavicornis, Laccophilus minutus, Hyphydrus ovatus* and *Enochrus testaceus.* The main habitats represented were cutover bogs and rafts of acid fen vegetation occasionally receiving base-enriched water.

I. This group was representative of stagnant peat bogs unrelieved by supplies of base-rich water. *Enochrus affinis,* a species confined to small pools in *Sphagnum* bog including water-filled peat cuttings, was additional to the other supposedly acidophilic species of Group H.

J. Montane flushes and ditches in bogs were related by a water beetle assemblage dominated by *Hydroporus* species: *gyllenhalii, longulus, memnonius, nigrita, obscurus,* and *tristis.* Rarer species of the flush habitat were *Paracymus scutellaris* and *Laccobius atratus.*

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