

**The breeding status of Common
Scoter *Melanitta nigra* in Ireland,
2012**



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The breeding status of Common Scoter *Melanitta nigra* in Ireland, 2012

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Executive Summary

In 2012 pre-breeding and brood surveys of Common Scoter were carried out at four known breeding sites in Ireland. A potential breeding population of 39 pairs is estimated. Lough Corrib held the greatest number of Common Scoter with 28 pairs. Five pairs each were recorded at Loughs Ree and Arrow and one pair was recorded at Loughs Conn and Cullin.

The Irish breeding Common Scoter population has declined by 50% since 1999 and by 60% since 1995. While numbers at Lough Corrib are comparable to 1995, they have declined since 1996. The decline in breeding numbers at Loughs Conn and Cullin recorded in the mid- to late 1990's has continued with no successful breeding in 2012. The Lough Ree population has declined from 32 pairs in 1999 to only 5 pairs in 2012. Breeding was recorded at Lough Arrow in 1999 and numbers at this site have remained stable.

Five (18%) of the potential breeding pairs at Lough Corrib hatched young (hatching success), with 0.8 ducklings produced per breeding pair (productivity). Hatching success was higher at Lough Arrow (80%) and Lough Ree (60%) and productivity was comparable between sites (1.0 at Lough Arrow; 0.8 at Lough Ree).

The male to female sex ratio was 1.3:1.0 at Lough Corrib compared to 2.4:1.0 at Lough Ree, 6.0:1.0 at Loughs Conn and Cullin and 2.6:1.0 at Lough Arrow.

To prevent further declines in the Irish breeding Common Scoter population a number of actions are recommended including increased monitoring, investigation into potential reasons for decline and continued predator control.

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1. Introduction

Common Scoter *Melanitta nigra* breed throughout the low arctic in Scandinavia and across Siberia (Perrins & Cramp, 1997), the former American race (*americana*) now being treated as a full species (Parkin & Knox, 2010). Iceland, Scotland and Ireland support small outlying breeding populations. In Scotland the Common Scoter breeding population has declined from 95 pairs in 1995 to 52 pairs in 2007 (Hancock, 2012). In Ireland breeding numbers have declined from 100 pairs in 1995 to 80 pairs in 1999 (Tierney, 2001). It is speculated that individuals from the Scandinavian breeding populations of Common Scoter winter off the coast of Ireland and the UK (Wernham *et al.*, 2002). Flock sizes of Common Scoter wintering in Ireland are thought to be declining, with the most recent wintering population estimate at 7,480 individuals (Boland & Crowe, 2012). The breeding population of Common Scoter is included on the Red-list of Birds of Conservation Concern in Ireland (Lynas *et al.*, 2007).

1.1 History of Common Scoter in Ireland

Common Scoter was first recorded breeding in Ireland in 1905 on Lower Lough Erne (Co. Fermanagh, Ussher, 1905) and numbers increased to about 50 pairs in 1952 (Ruttledge, 1987). During this time, Common Scoter was recorded on Lough Conn (1943), with breeding confirmed in 1948 (Ruttledge, 1987). Between 1950 and 1967/8 the scoter populations on Lower Lough Erne and on Lough Conn increased to 170-180 pairs¹ (152 pairs on Erne; 28-30 on Conn) (Ruttledge, 1987). At this time, scoters were also recorded on Lough Carra (max. three pairs) (Ruttledge, 1987). The Lough Erne breeding population began to decline throughout the 1970's and 1980's. During this period breeding was confirmed on Lough Cullin (1983) and the Lough Conn and Cullin population increased to 32 pairs (Ruttledge, 1987).

In the early 1980's breeding was confirmed on Lough Corrib (1981) and Lough Ree (1984) (Ruttledge, 1987) and by 1987 the Irish breeding population was estimated to be 68-78 pairs (Partridge & Smith, 1988). By 1993 the Lough Erne breeding Common Scoter population had become extinct (Gittings, 1995). Nonetheless by 1995 the Irish population rose to 100 pairs, due to increased breeding numbers at Lough Ree and Lough Corrib, with numbers at Loughs Conn and Cullin remaining stable (Gittings 1995). Between 1995 and 1999 the Irish population declined to 80 potential pairs. During this period a dramatic decline in breeding numbers was recorded at Loughs Conn and Cullin, numbers remained stable at Loughs Corrib and Ree, and scoter were first recorded breeding on Lough Arrow (Tierney *et al.*, 2000).

1.2 Previous Surveys

Previous breeding Common Scoter surveys focused solely on Lough Erne until 1985/86 when the first survey of the Irish breeding population was undertaken (Ruttledge, 1987). This survey involved 33 surveyors visiting 160 lakes throughout Ireland. The first systematic survey, of known and potential breeding sites using standard survey methods, was completed in 1995 (Gittings, 1995). This survey of

¹ Where a range is given for the breeding population the minimum is observed pairs (definite and probable) and the maximum the number of potentially breeding females

the core breeding sites was repeated in 1996 following the oil spill from the MV *Sea Empress* (Delaney & Gittings, 1996). Tierney repeated the 1995/1996 surveys in 1999 (Tierney, 2001) and since then, incidental records of breeding Common Scoter have been collated by National Parks and Wildlife (NPWS) staff along with a survey of Loughs Conn and Cullin in 2004 (Heffernan & Hunt, 2004).

Brood survey data on Common Scoter productivity and hatching success is available for Lough Corrib (Tierney, 2001; Partridge & Smith, 1988) and for Lower Lough Erne, Loughs Conn and Cullin and Lough Ree (Partridge & Smith, 1988). However, hatching success and productivity data derived from a systematic brood survey of all Common Scoter breeding sites is not available.

In 2012 the National Parks and Wildlife Service funded a re-survey of the Common Scoter breeding population together with brood surveys at all known Common Scoter breeding sites.

2. Survey Objectives

1. To establish the current distribution of breeding Common Scoters in Ireland.
2. To obtain a reliable estimate of the current Irish Common Scoter breeding population.
3. To compare this estimate with that of previous surveys.
4. To complete brood surveys at all Common Scoter breeding sites.
5. To estimate hatching success and productivity at Common Scoter breeding sites in 2012.

3. Methods

The survey methods, which are outlined below, broadly follow those described by Gittings (1995).

3.1 Survey sites

Priority and non-priority sites were selected for field survey (Table 1; Figure 1), based on previous surveys in Ireland (Gittings, 1995; Delaney & Gittings, 1996; Tierney *et al.*, 2000, Tierney, 2001). Priority sites were those with breeding Common Scoter in the 1995, 1996 and 1999 surveys, while non-priority sites were those identified by Gittings (1995) as historical, possible or potential breeding sites (Appendix A).

Due to logistical constraints, it was not possible to survey all non-priority sites, and a consultation process was initiated to identify any sites with summer records of Common Scoter since 1995. The consultation process involved contacting local BirdWatch Ireland representatives, local ornithologists, as well as regional and local National Parks and Wildlife Service (NPWS) staff (Appendix B). No confirmed summer records of Common Scoter were reported from any non-priority sites. While Lower Lough Erne is a historical breeding site, this site is monitored by the RSPB in Northern Ireland and was not included in this survey.

Brood surveys were completed at Loughs Corrib, Ree, Arrow, Conn and Cullin.

Table 1: Characterisation of priority and non-priority sites identified for survey in 2012. Trophic Status from EPA report for years 2007-2009 (McGarrigle *et al.*, 2009).

Site	Surface area (Ha)	Trophic status
Known breeding site - Priority		
Upper Lough Corrib	16,562	Mesotrophic
Lough Conn and Cullin	5,720	Oligotrophic
Lough Ree	10,000	Oligotrophic
Lough Arrow	1,240	Mesotrophic
Historical breeding sites - Non-Priority		
Lower Lough Erne	10,000	Eutrophic
Lough Carra	1600	Oligotrophic
Potential breeding site - Non-Priority		
Lough Mask	8,100	Oligotrophic
Lough Melvin	2,200	Mesotrophic
Possible breeding sites - Non-Priority		
Lough Key	870	Oligotrophic
Lough Gara	1,200	Oligotrophic
Lough Gill	1,400	Oligotrophic

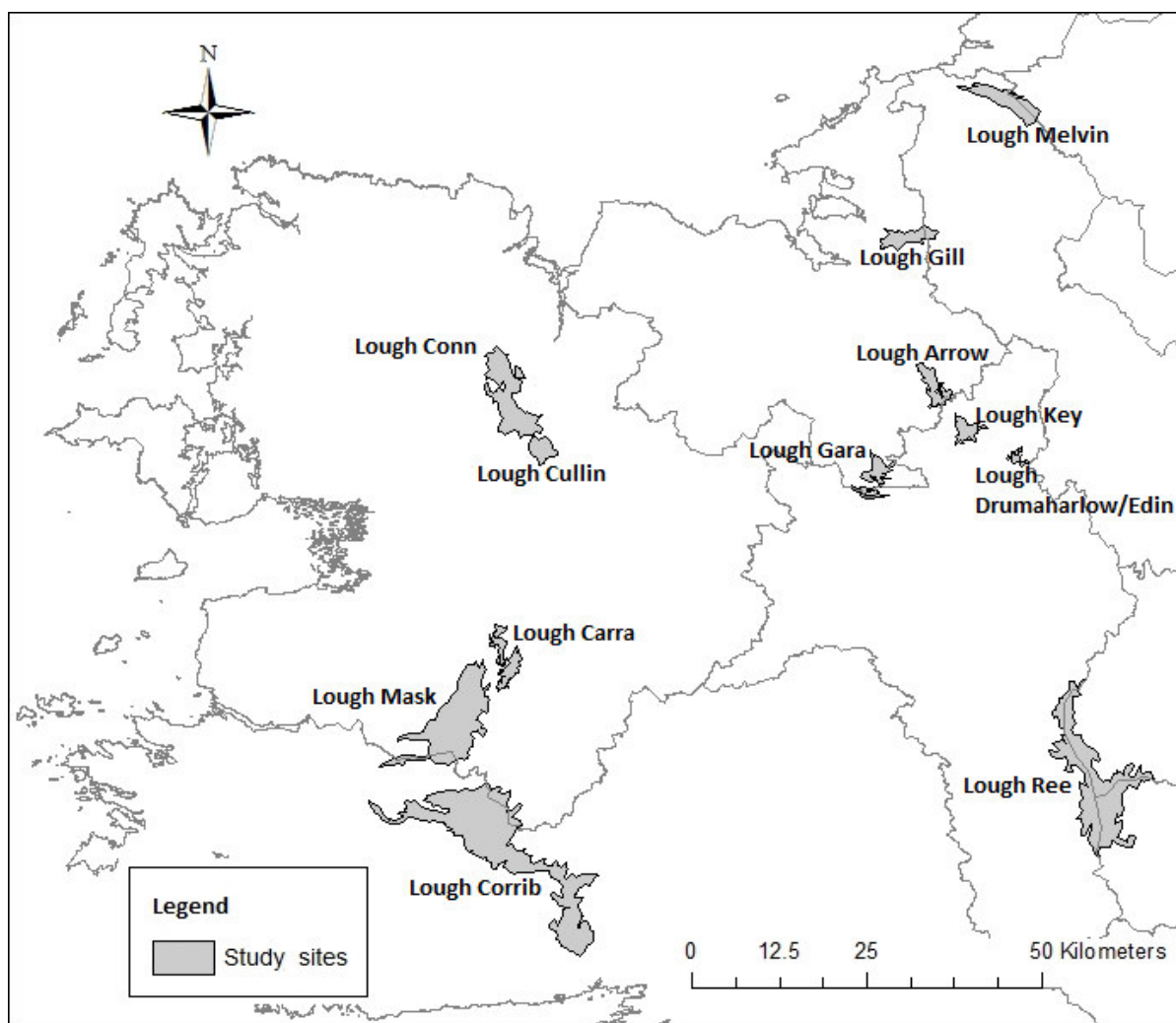


Figure 1: Location of priority and non-priority sites surveyed in 2012.

3.2 Coverage of survey sites and timing of visits

3.2.1 Pre-breeding census

All priority sites were surveyed by boat twice during the optimal 7th–21st May period as recommended by Tierney (2001) (Table 2). With the exception of Lough Corrib, all priority sites were surveyed completely on both visits. The gap between visits was at least five days. Lough Corrib was surveyed completely on the first visit and this required seven survey days. Two surveyors were on Lough Corrib in separate boats for two of these days, thus full coverage was achieved over a 5 day period. As in previous pre-breeding surveys of Lough Corrib, Common Scoter was only recorded in the upper lough and none were found in the deep water arm extending west of Doon to Maum. For the second visit, surveys targeted the upper lough only, excluding the deep water arm west of Doon. The second visit was completed in four survey days, using 2 surveyors in 2 separate boats. A third visit to Lough Corrib on 21st May focused on the Oughterard area to resolve potential double counting errors during the second visit. A third visit was also made to Lough Conn on May 24th to establish the presence or absence of a large group of female scoter, which were recorded during the second visit.

Table 2: Coverage of priority sites with date of survey, visit number and boat usage during 2012.

Site	Date	Visit No.	Survey Type	No. Of boats
Lough Corrib	6 th May	1	Full census	1 boat
	8 th May	1		2 boats
	9 th May	1		2 boats
	10 th May	1		1 boat
	11 th May	1		1 boat
	15 th May	2	Full census (Upper Lough only)	2 boats
	16 th May	2		2 boat
	21 st May	3	Re-survey: Oughterard area only	1 boat
Lough Ree	8 th May	1	Full census	1 boat
	9 th May	1		1 boat
	10 th May	1		1 boat
	16 th May	2	Full census	1 boat
	18 th May	2		1 boat
	19 th May	2		1 boat
Lough Conn/Cullin	8 th May	1	Full census	1 boat
	9 th May	1		1 boat
	15 th May	2	Full census	1 boat
	17 th May	2		1 boat
	24 th May	3		Partial census
Lough Arrow	7 th May	1	Full census	1 boat
	14 th May	2	Full census	1 boat

All seven non-priority sites were covered once between the 7th and 21st May (Table 3). All non-priority sites were surveyed by boat, except for the west shore of Lough Mask, and Lough Gara which were covered from the shore.

Surveys were not undertaken where winds were greater than Beaufort Force 4, during heavy rain, or where the water was very choppy.

Table 3: Coverage of non-priority sites and platform type during 2012.

Site	Date	Survey type	Platform
Lough Drumaharlow	11 th May	Full census	Boat
Lough Gill	17 th May	Full census	Boat
Lough Gara	24 th May	Partial census	Shore
Lough Key	24 th May	Full census	Boat
Lough Carra	8 th May	Full census	Boat
Lough Mask	12 th May	Full census	Shore
Lough Mask	16 th May	Full census	Boat
Lough Melvin	11 th May	Full census	Boat

3.2.2. Brood survey

Brood surveys were carried out at Lough Ree, Loughs Conn and Cullin, Lough Arrow and Lough Corrib, all of which had Common Scoter during the pre-breeding survey. These sites were surveyed

at least twice between mid-July and 17th August following Partridge and Smith (1988). Tierney (2001) identified the last two weeks in July and the first week of August as optimal to estimate hatching success and productivity and most surveys were carried out during this window. The gap between surveys was at least seven days.

On Lough Corrib only those areas with Common Scoter during the pre-breeding survey were targeted for brood surveys. Three visits were completed within the optimal survey period, with a fourth visit at the end of August, outside of this period (Table 4). Each survey was carried out by two surveyors in two separate boats in order to cover all core breeding areas. The last visit targeted the Oughterard area only and required only one surveyor and one boat. This visit was to establish duckling survival to fledging.

On Lough Ree only those areas where scoter were found during the pre-breeding survey were targeted for brood surveys. Lough Ree was surveyed three times, twice within the optimal survey window and once during late August (Table 4). The third survey was delayed due to weather constraints.

Loughs Conn and Cullin were surveyed twice during the optimal survey period (Table 4). On the first visit all of Lough Cullin and most of Lough Conn was surveyed. Due to weather conditions the north east shore of Lough Conn was not surveyed. On the second visit only Lough Conn was completely surveyed. As no broods were found on either survey Loughs Conn and Cullin were not surveyed a third time

Lough Arrow was surveyed on three dates within the optimal survey period (Table 4). On each occasion the complete lake was surveyed.

All brood surveys were carried out by boat and were not undertaken where winds were greater than Beaufort Force 4, during heavy rain or where the water was very choppy.

Table 4: Survey dates for brood surveys, 2012

Site	Visit 1	Visit 2	Visit 3	Visit 4
Lough Corrib	13th July	25th July	7th August	29th August
Lough Ree	14th July	30th July	24th August	
Lough Arrow	13th July	30th July	13th August	
Lough Conn/Cullin	16th July	8th August		

3.3 Survey Methods

Field methods for recording Common Scoter were based on Gittings (1995) and are detailed in Appendix C. Ancillary data on habitat types followed the categories identified by Gittings (1995) and by Tierney (2001). Data on predators, human activity, and other waterbirds was also collected during the survey. Hand held GPS devices and paper maps were used to record the location of Common Scoter.

3.3.1 Common Scoter breeding population survey techniques

All priority sites were surveyed systematically by boat following the shoreline and circling each island. Both the shoreline and open waters were regularly scanned using binoculars. The distance

from the shoreline and the speed of the boat varied depending on weather conditions and the presence of submerged rocks.

All Common Scoter observed were (where possible) aged, sexed and identified as individuals or pairs. Their locations were marked onto Ordnance Survey maps (scale: 1:50,000) with a six-figure grid reference. Care was taken to avoid count duplication. When mixed groups of males and females were seen together any persistent pair associations were noted. Notes of behaviour such as preening, feeding or loafing were also made.

3.3.2 Estimating the breeding population.

Following Gittings (1995), Underhill (1998) and Tierney (2001), an estimate of the breeding Common Scoter population can be expressed as the number of females present regardless of pairing status. This approach assumes that all females subsequently attempt to breed and is based on the assumption that non breeding birds remain in coastal waters. This method results in a maximum number of potential breeding pairs. While this convention is generally followed, flocks of female scoter recorded later in the season and judged to be immature females and/or non breeders can be discounted from population estimates (e.g. Gittings 1995)

3.3.3 Common Scoter brood surveys

The methodology followed that of the pre - breeding survey. All surveys were carried out by boat by scanning the shoreline and lake with binoculars and circling the islands. All scoter observations were recorded and any ducklings observed were aged following Gollop and Marshall (1954; Appendix D).

3.3.4 Estimating factors in breeding success

Hatching success was calculated as the number of broods per potential breeding female. Productivity was calculated as number of ducklings reaching Class IIa (c.23 days old) produced per potential breeding female and does not necessarily indicate fledging success. This follows the calculation used in Scotland (Hancock pers., comm.).

3.3.5. Habitat

Islands and their habitats were recorded during the pre-breeding survey (Appendix C). Note was taken of islands with associating Common Scoter. Evidence of grazing (sheep/cattle/goats) was also recorded.

3.3.6. Potential factors of disturbance

Predators

The presence of any mammalian (mink, fox, etc.) or avian predators (Raptors, Corvids etc.) was recorded during surveys (Appendix C).

Human activity

Where human activities were observed on the lake or its islands with the potential to disturb Common Scoter, these activities were recorded and potential impact rated according to survey methods (Appendix C).

3.3.7. *Ancillary waterbird data*

Where time permitted, other waterbirds were identified and recorded during the pre-breeding survey. When possible, numbers, age, sex and breeding status was recorded.

The location of gull and tern colonies was noted together with a population estimate. Apparently Occupied Territories (AOT) were recorded where possible, otherwise the number of individuals was estimated. Isolated nests were generally not counted.

4. Results

4.1 The Irish Common Scoter population

4.1.1 Population estimate

The maximum number of adult females, excluding those presumed to be non breeding females, is 28 at Lough Corrib, five at Lough Ree, one at Lough Conn and Cullin and five at Lough Arrow. This gives an estimated national breeding population of 39 pairs (Table 5)

Table 5: Summary of total numbers of pairs and male to female sex-ratio for the 2012 Scoter survey.

Site	Visit	Pairs [^]	Single male	Single female	Total male	Total female	Total in-dividual	% male	% Paired female	Male: Female
Lough Corrib	1	13	24	15(1)*	37	28	65	57	46	1.3:1
Lough Corrib	2	26	10	0	36	26	62	58	100	1.4:1
Lough Ree	1	5	7	0	12	5	17	71	100	2.4:1
Lough Ree	2	4	7	0	11	4	15	73	100	2.7:1
Lough Conn/Cullin	1	1	5	0	6	1	7	86	100	6.0:1
Lough Conn/Cullin	2	1	1(3) ⁺	0(15) ⁺	2	1	3	67	100	2.0:1
Lough Arrow	1	5	8	0	13	5	18	72	100	2.6:1
Lough Arrow	2	4	2	0	6	4	10	60	100	1.5:1
Total	1	24	44	15(1)*	68	39	107	63	61	1.7:1
Total	2	35	20(3)⁺	0(15)⁺	55	35	90	61	100	1.6:1

[^]Includes definite and probable pairs (see Table 6)

* Immature female in parentheses not included in breeding population estimates.

⁺Group of 15 female and 3 male scoter in parentheses which are presumed to be transient non-breeding birds and not included in breeding population estimates.

4.1.2 Pre – breeding census

A total of 32 definite and three probable pairs of Common Scoter were recorded on the four priority sites of Loughs Corrib, Ree, Conn and Cullin and Arrow (Table 6). No Common Scoter were detected at any of the eight non-priority sites.

Lough Corrib held the greatest number of Common Scoter with a maximum of 25 definite, and one probable pair in the second visit. Lough Ree had three definite and two probable pairs, Lough Arrow had four definite and one probable pair and only one probable breeding pair was recorded at Loughs Conn and Cullin. The only site with a substantial increase in the number of pairs between the two visits was Lough Corrib with a maximum of 13 pairs on the first visit and 26 on the second visit.

Single adult male scoter were recorded at all sites with the largest number recorded at Lough Corrib on visit 1. The number of single adult males decreased between visit 1 and visit 2 at all sites, except Lough Ree, where the number remained constant between both visits.

Lough Corrib was the only site with unpaired or single female Common Scoters during visit 1. This included a group of 11 females (together with eight single males), with four others occurring at separate locations. At Lough Conn a group of 15 single female (with three single male scoters) were recorded during visit two. A third visit to check for their presence did not locate this group again. Single female scoters were not recorded at any other site on visit two.

Table 6: Results from the 2012 Common Scoter survey

Site	Visit no.	Definite pair	Probable pair	Single adult male	Unaged single male	Single female	Single immature female	Un-sexed
Lough Corrib	1	11	2	24	0	15	1	0
Lough Corrib	2	25	1	10	0	0	0	3
Lough Ree	1	3	2	6	1	0	0	0
Lough Ree	2	3	1	2	5	0	0	0
Lough Conn/Cullin	1	0	1	5	0	0	0	0
Lough Conn/Cullin	2	0	1	1	(3)*	(15)*	0	0
Lough Arrow	1	4	1	8	0	0	0	0
Lough Arrow	2	4	0	2	0	0	0	0
Total	1	17	6	43	1	15	1	0
	2	32	3	15	5	0	0	3

*Group of 18 birds recorded together and presumed to be transient and non-breeding.

4.1.3 Brood Surveys

In total 11 Common Scoter broods were recorded on Loughs Corrib, Ree and Arrow. None were found at Loughs Conn and Cullin. Five broods were recorded on Lough Corrib with three broods on Lough Ree and three broods on Lough Arrow (Table 7). The greatest number of ducklings was recorded at Lough Corrib, but relative hatching success was higher at Lough Ree and Lough Arrow. The timing of the brood surveys was sufficient to record ducklings reaching class IIa or IIb (c. 23-30 days). However, except at Lough Ree, where there was a late August survey, no ducklings were recorded in Class IIc or class III.

Table 7. Brood survey results, 2012

Site	Potential pairs	No. of broods	Hatching success	Max. no. of ducklings	No. of ducklings reaching class II	Productivity [^]
Lough Corrib	28	5	18%	25	21	0.8
Lough Ree	5	3	60%	6	4	0.8
Lough Conn/Cullin	1	0	0	0	0	0
Lough Arrow	5	3	60%	10	5	1.0
Total	39	11	28%	41	30	0.8

[^] Estimated as number of Class IIa or older ducklings per potential breeding pair

4.2 Site Accounts

4.2.1 Lough Corrib

Pre – breeding survey

The maximum number of pairs recorded on Lough Corrib is 26 (this includes definite and probable pairs). The maximum number of mature single females is 28 and the maximum number of single males is 37. Three unsexed birds recorded in flight are not considered further in population estimates for the site. The male:female ratio was 1.3 males to 1 female on both visits (Table 8).

On visit one, 13 pairs of scoter, 16 single female and 24 single males, were recorded. On visit two the number of pairs increased to 26, no females were recorded and the number of single male birds decreased to ten. Three single female scoter counted on visit one were not accounted for on visit two. Two of these single females were considered to be potentially breeding females and the third was observed to be an immature bird.

Table 8: The number of pairs and individual birds recorded on Lough Corrib in visit 1 and visit 2.

Visit	Definite pair	Probable pair	Single adult male	Unaged single male	Single female	Single immature female	Unsexed	Male: Female ratio
One	11	2	24	0	15	1	0	1.3:1
Two	25	1	10	0	0	0	3	1.3:1

A third visit to Lough Corrib was completed to resolve possible double counting errors in the Oughterard to Ard area (Area 4; Figures 2 & 6; Table 9). During this visit 14 pairs of Common Scoter and three single male scoter were recorded, compared to 13 pairs, eight single males and one single female in visit 2. The third visit to Area 4 did not record a breeding pair of Common Scoter south of Ard, however this is a complex area with many islands and inaccessible shallows and a single pair from this area may have been missed. The total for Area 4 is therefore the count from visit three, plus one pair from south of Ard, giving 15 pairs, and 3 single males.

Pre-breeding distribution

The Common Scoter population on Lough Corrib was concentrated in the upper lough (Figure 2). Within the upper lough, Common Scoter were concentrated in Area 4 (Oughterard to Ard; Figure 6) and Areas 1 and 2 (the Doorus peninsula; Figures 6, 3 and 4), particularly the islands on its north side in Area 2 (Figure 4). Smaller numbers of breeding pairs were recorded outside of these core areas around Inchnagoill in Area 3 (Figure 5) and between Inishmacateer and Inchiquin in Area 5 (Figure 7). One group of 11 female and 8 male Common Scoter was recorded in open water, within Area 5. Between visits the number of breeding pairs within each Area increased. The increase was most marked in Areas 2 (Dorus) and 4 (Oughterard to Ard).

Table 9: Changes in distribution of Common Scoter on Lough Corrib between visit 1 and visit 2.

Area/Visit	Visit	Definite pairs	Probable pair	Single adult male	Single female	Un-sexed	Single immature female
Doorus-Cornamona (Area 1 and 2)	1	4		8	2		
	2	6	1	3			
Inchagoill (Area 3)	1		1	1			
	2	2		1		3	
Oughterard-Ard (Area 4)	1	6	1	1			1
	2	13		8	1		
	3	14		3			
Inishmacateer-Inchiquin (Area 5)	1	1		13	13		
	2	2		3			

Other observations

During the pre-breeding survey thirteen observations were made of Common Scoter associating with islands. Eleven of the islands were wooded grazed, one was wooded and one scrub covered. Common Scoter recorded in the Oughterard, Doorus and Inchagoill areas showed clear associations with islands in many cases. No island associations were recorded for the birds observed in the Inishmacateer to Inchiquin area.

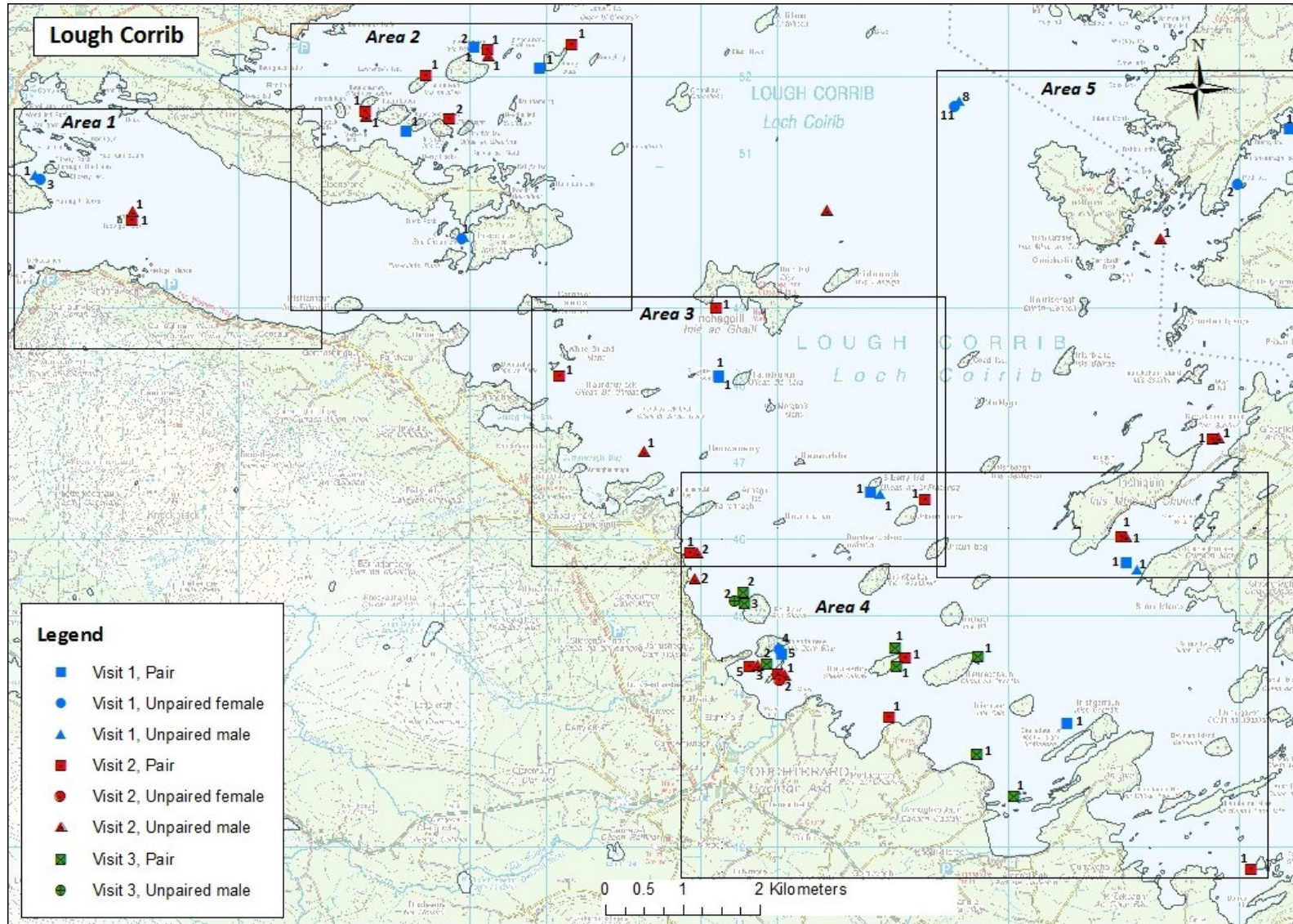


Figure 2. Overview of distribution of Common Scoter recorded during the breeding season on Lough Corrib in 2012 (Area detail in following maps).

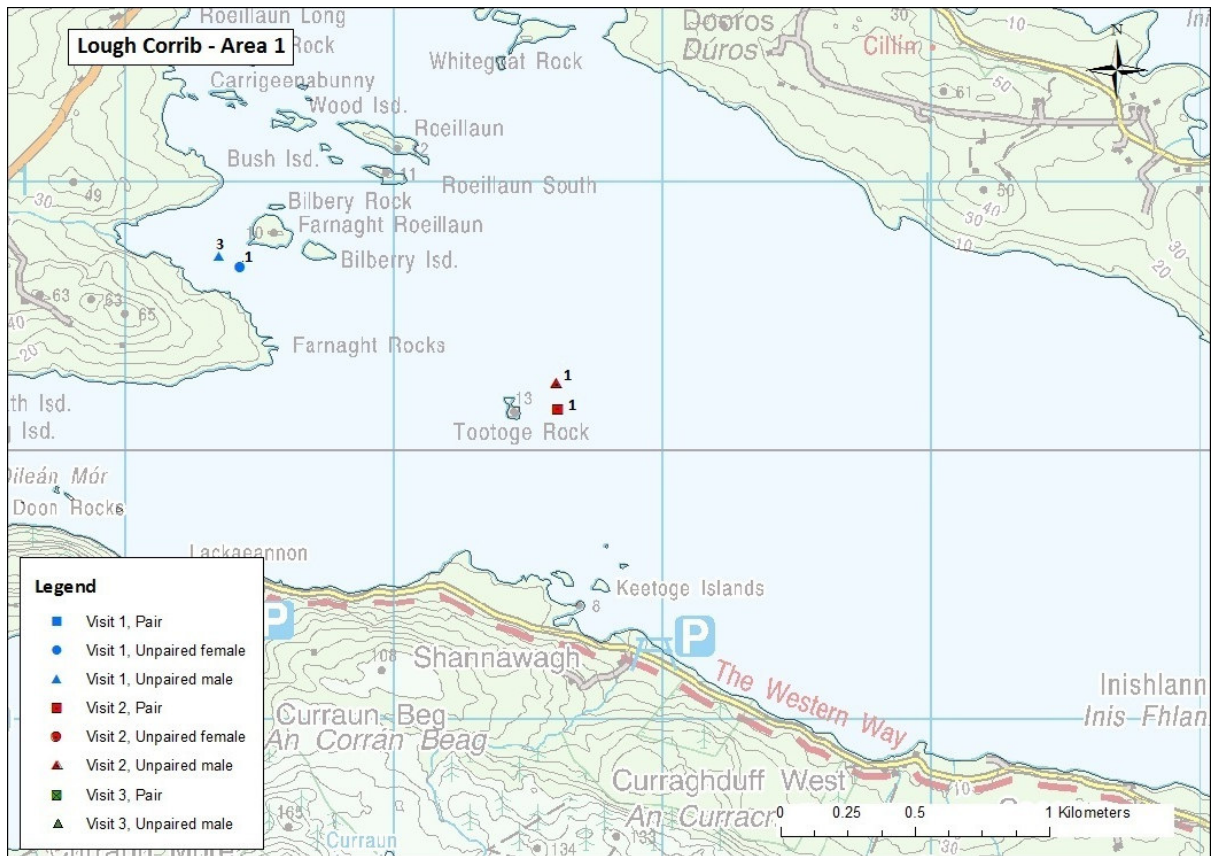


Figure 3. Common Scoter distribution in 'Area 1' on Lough Corrib, 2012.

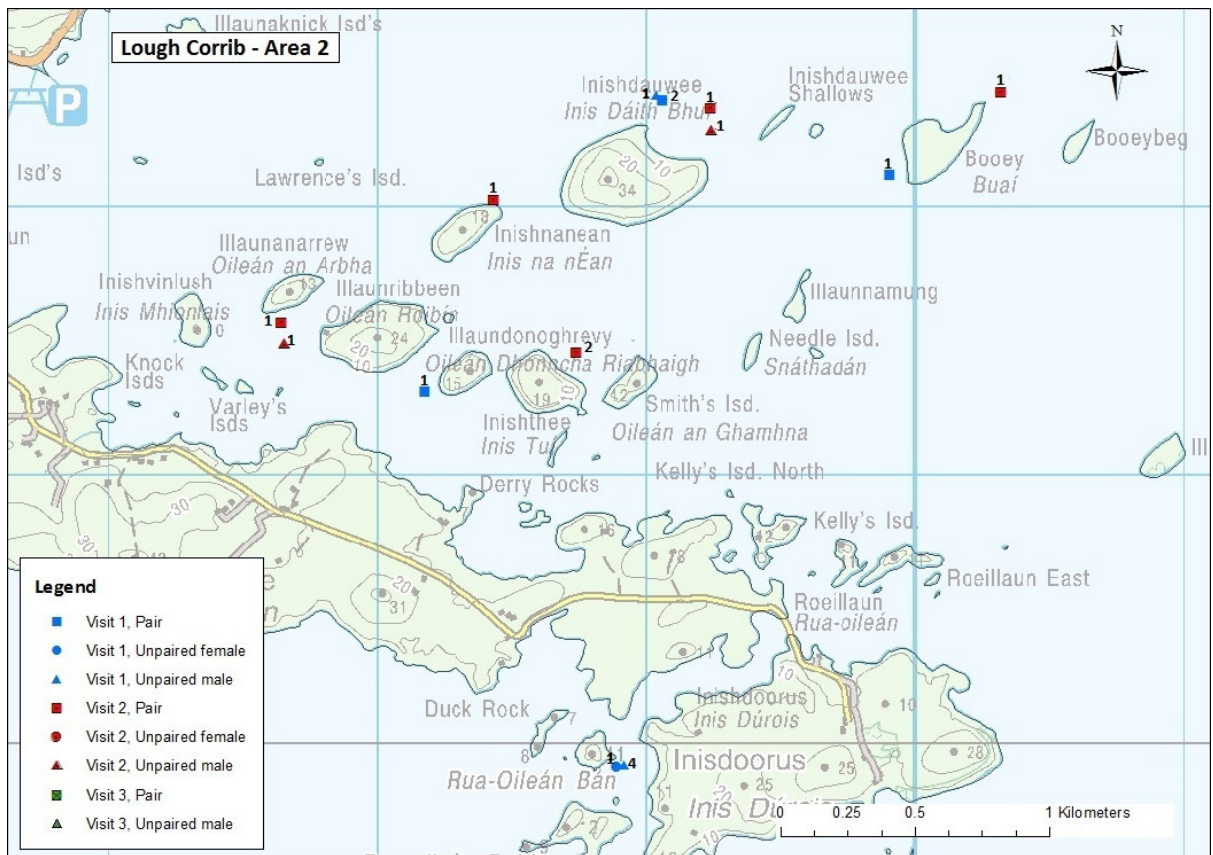


Figure 4. Common Scoter distribution in 'Area 2' on Lough Corrib, 2012.



Figure 7. Common Scoter distribution in 'Area 5' on Lough Corrib, 2012.

Brood survey

From a total of 28 potential pairs, five broods, comprising a maximum of 25 ducklings were recorded from Lough Corrib (Table 10). All broods occurred in a small area around Oughterard (Figure 8). Hatching success was 18% and productivity was 0.8.

On visit one (13th July) two broods were recorded at Oughterard. The second visit recorded five broods and 24 ducklings, showing the loss of one duckling. The third visit noted the same broods as the second visit but the broods were of an older age class and two ducklings were missing. The majority of ducklings on the third visit were Class IIa (c. 3 weeks old).

A fourth visit was undertaken to determine the numbers of ducklings with a greater probability of fledging (i.e age Class IIc or older). This visit was postponed to late August due to weather conditions. No ducklings were recorded in visit four, however those which survived are likely to have fledged by late August and therefore would not have been recorded.

During brood surveys adult female scoter were recorded either on their own or in groups, with notably high numbers at Oughterard (Table 10). The Doorus-Cornamona area held one single adult female on the first visit, two on the second, and none on the third visit. Those females are assumed to either be incubating (single females) or failed breeders (groups). No adult scoter were found in the Inchagoill or Inishmacateer-Inchiquin areas.

Table 10: Results from brood surveys on Lough Corrib, showing age class distribution, total ducklings, broods and numbers of single adult females.

Area /Visit	Age Class of ducklings							Total ducklings	Total broods	Single Females Without Broods
	Class I			Class II			Class III			
	a	b	c	a	b	c				
Doorus-Cornamona										
13 th July - Visit 1	0	0	0	0	0	0	0	1	0	1
25 th July - Visit 2	0	0	0	0	0	0	0	2	0	2
7 th - Aug Visit 3	0	0	0	0	0	0	0	0	0	0
Oughterard-Ard										
13 th July - Visit 1	0	7, 7	0	0	0	0	0	14	2	11, 2, 1, 1, 1
25 th July - Visit 2	9, 1	6	7	0	0	1*	0	24 (+1)**	5	2
7 th Aug - Visit 3	0	0	1	7, 6	7	1*	0	22 (+2)**	5	4
29 th Aug - Visit 4	0	0	0	0	0	0	0	0	0	0
Total number of ducklings hatched								25		
Total number of ducklings reaching class II								22		
Productivity (numbers reaching class II/potential breeding pairs)								0.8		
Maximum number of broods								5		
Hatching success (broods/potential breeding pair)								18%		

*duckling without adult female.

** duckling losses between visits.

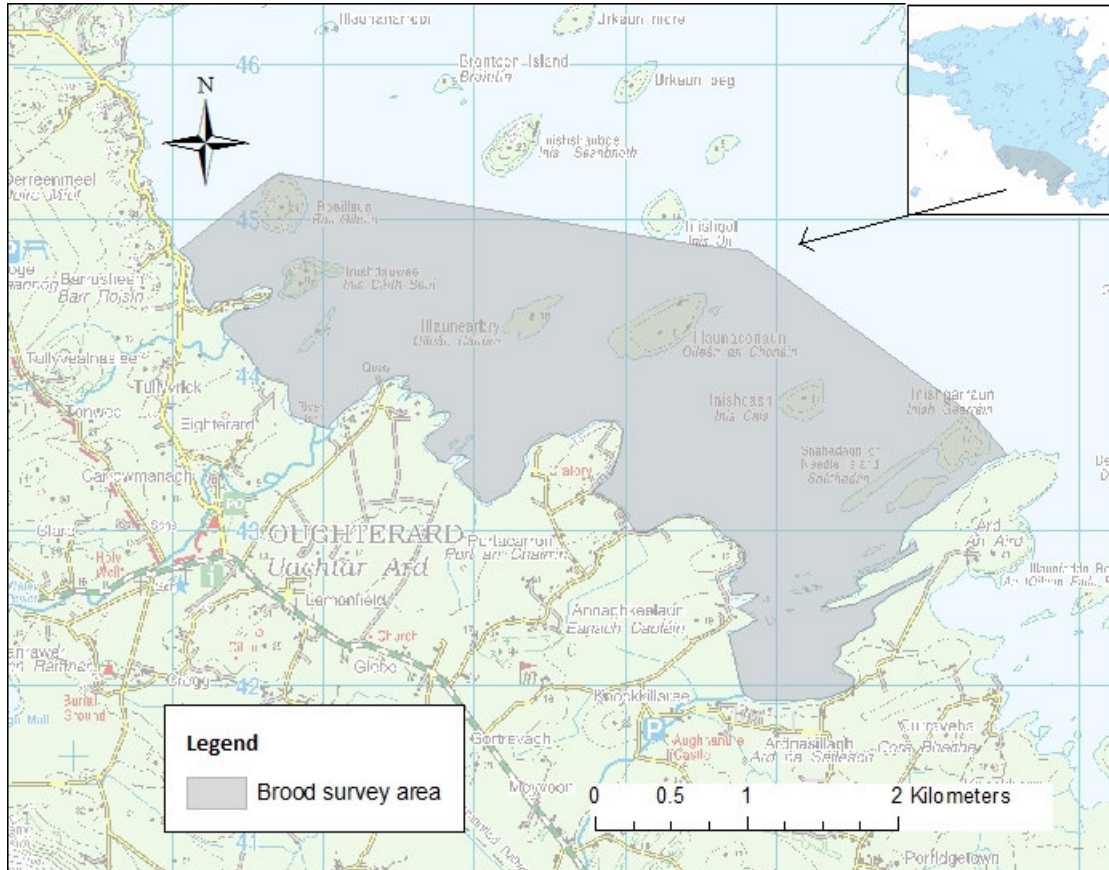


Figure 8. Area at Oughterard where all scoter broods on Lough Corrib were recorded.

4.2.2. Lough Ree

Pre – breeding census

At Lough Ree five pairs of Common Scoter were recorded on the first visit and four on the second visit. Seven single male scoter were recorded on both visits. No single female scoters were recorded on either visit. The male female ratio was 2.4 males to 1 female on the first visit, and 2.7 males to 1 female on the second visit (based on adult and un-aged males).

Table 11: The number of pairs and individual birds recorded on Lough Ree for both visits.

Visit	Definite Pair	Probable pair	Single Adult male	Un-aged single male	Single female	Single immature female	Un-sexed	Male: Female
One	3	2	6	1	0	0	0	2.4:1
Two	3	1	2	5	0	0	0	2.7:1

Pre-breeding distribution

Common Scoter were found in the northern and mid- sections of Lough Ree (Figure 9). They were recorded between Clavinch, Inchenagh and Inchleraun islands, in the northern half of the lough (Area 1: Figure 10), and mainly around the Black Islands in the mid - lough on both visits (Area 2; Figure 11). During visit one, four pairs of Common Scoter were recorded in Area 1. During visit two, there were two pairs in Area 1 and two pairs in Area 2.

Other observations

During the pre-breeding survey seven observations were made of Common Scoter associating with islands. Five of the islands were wooded grazed, and two were scrub covered.

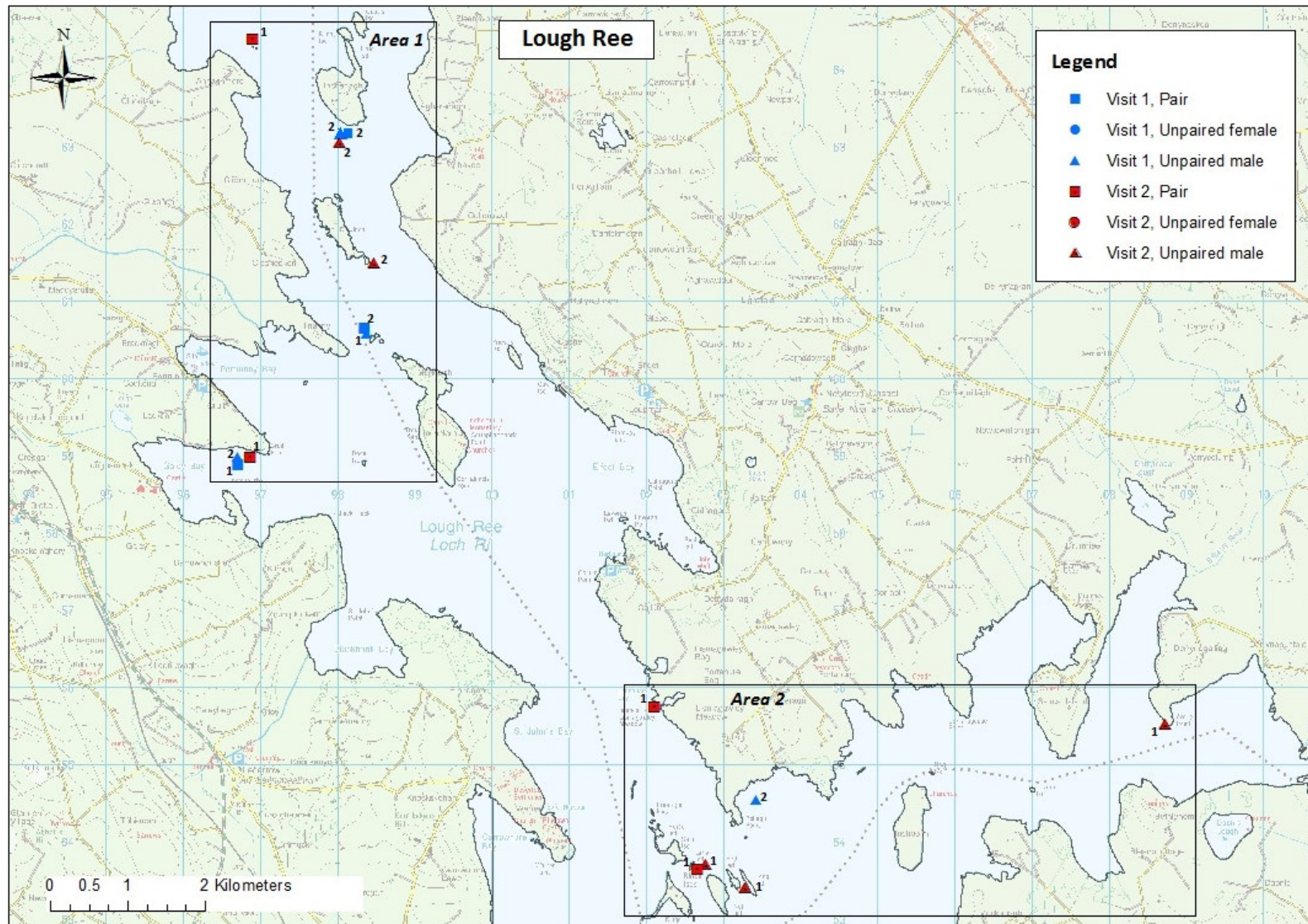


Figure 9. Overview of distribution of Common Scoter recorded during the breeding season on Lough Ree in 2012.

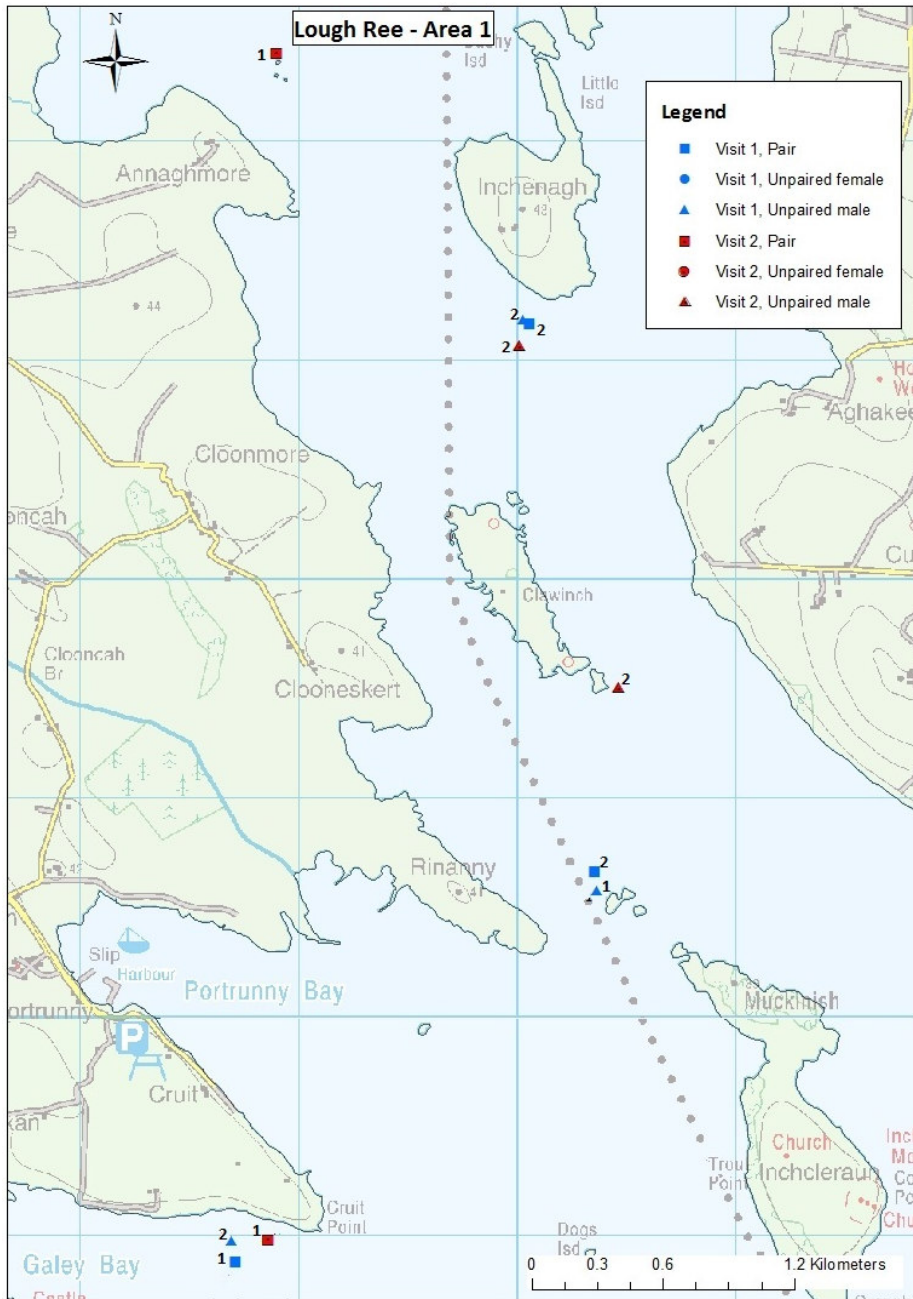


Figure 10. Common Scoter distribution in 'Area 1' on Lough Ree, 2012.

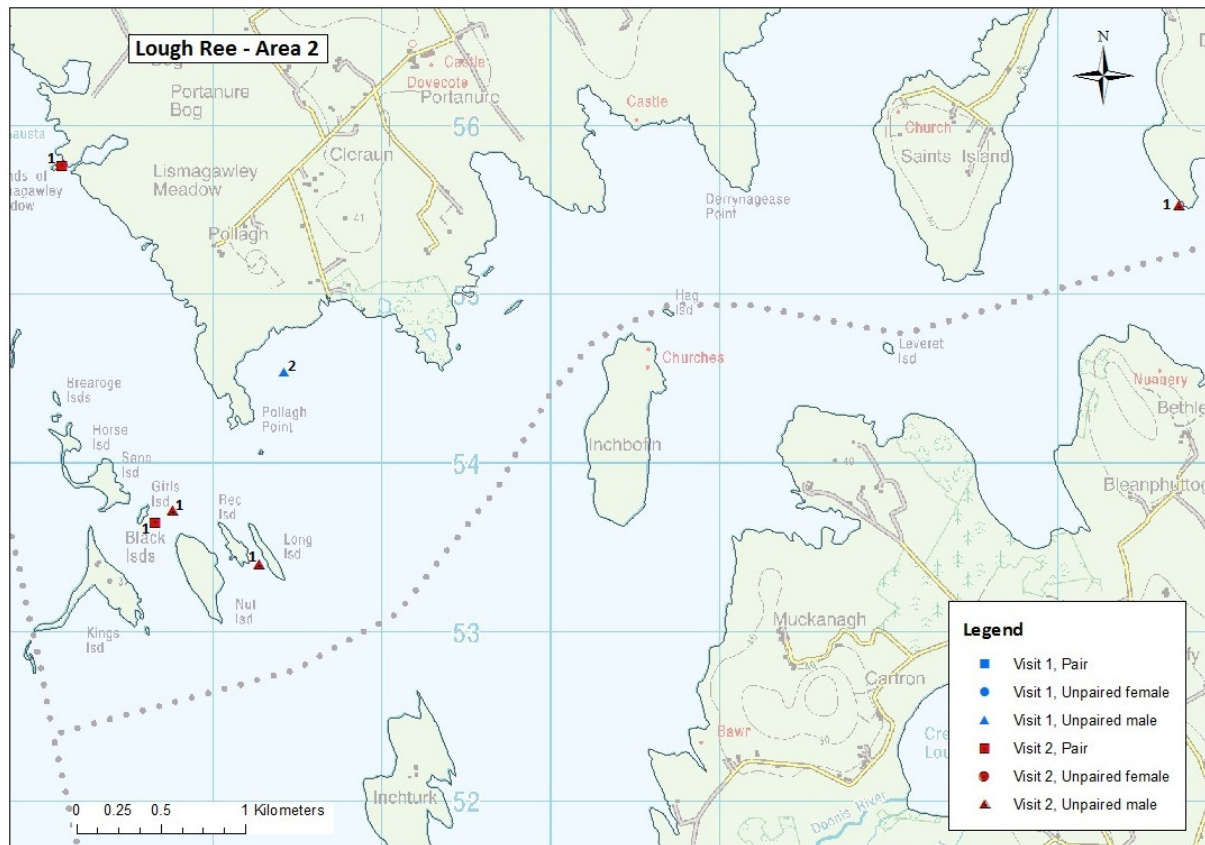


Figure 11. Common Scoter distribution in 'Area 2' on Lough Ree, 2012.

Brood survey

From a total of five potential pairs, three broods, comprising a maximum of six ducklings were recorded from Lough Ree. All broods were found in the middle of Lough Ree, south of Pollagh point near the Black Islands (Area 2; Figure 11). Common Scoter were recorded from this area during the pre-breeding survey. Hatching success was 60% and productivity was 0.80.

The first visit (14th July) found two broods and the second and third visits (30th July & 24th August) recorded three broods. The brood of three ducklings found in the first visit appears to have lost two ducklings by the second visit. On the third visit a third brood was found which appears to have been missed in the first survey as at age Class IIb this brood was 3-4 weeks old. The third survey was late in the season and recorded four ducklings of an older age class, as expected (Table 12). Given that two ducklings were lost between the first and the second visits on Lough Ree and four were recorded on the third visit, a total of six ducklings were produced from three broods.

Table 12: Results from the brood survey at Lough Ree.

Area /Visit	Age Class of ducklings						Total ducklings	Total broods	Single females without broods	
	Class I			Class II						Class III
	a	b	c	a	b	c				
Visit 1	0	2	0	0	3	0	0	5	2	
Visit 2	0	0	0	0	1, 2	1	0	4 (+2)*	3	1
Visit 3	0	0	0	0	0	1,2, 1	0	4	3	0
Total number of ducklings hatched								6		
Total number of ducklings reaching class II								4		
Productivity (numbers reaching class II/potential breeding pairs)								0.8		
Maximum number of broods								3		
Hatching success (broods/potential breeding pair)								60%		

4.2.3. Loughs Conn and Cullin

Pre-breeding census

At Loughs Conn and Cullin a single probable pair of Common Scoter was recorded on both the first and second visits. Excluding a group of 18 scoters recorded on the second visit, the number of single adult male scoters dropped from five birds on the first visit to one on the second visit. No single female scoters were recorded on either visit. On the second visit a group of 18 scoters were recorded in the middle of the lake comprising 15 adult females and 3 un-aged males. This group was assumed to be transient non breeding birds. A third visit to Lough Conn and Cullin confirmed that the group were no longer present and this data has not been used as part of the breeding population estimate. The male to female ratio dropped from six males to one female in the first visit, to three male to one female in third visit.

Table 13: The number of pairs and individual birds recorded on Loughs Conn and Cullin visit 1 and visit 2.

Visit	Definite pair	Probable pair	Single adult male	Un-aged single male	Single female	Single immature female	Unsexed	Male: Female
One		1	5					6:1
Two		1	1	3*	15*			2:1*
Three		1	2					3:1

*Excluding the group of 15 female and three male in the ratio estimate.

Pre-breeding distribution

On visit one, Common Scoter were recorded at Rinmore (one male; Area 1; Figure 12 & 13), Massbrook (one pair & three single males; Area 2) and on Lough Cullin (one male; Area 2; Figure 12 & 14). On visit two, one pair and one single male were recorded at Massbrook and a group of 15 single female and three single male birds recorded in open water at the north end of the lake (Area 2). During the third visit to the lake one single pair, and one single male were recorded south of Errew and one single female at Annagh (Area 1)

Other observations

During the pre-breeding survey, three observations were made of Common Scoter associating with islands. One was bare grazed, one rocky and the other wooded grazed.

Brood survey results

No adult scoters or ducklings were recorded during either of the brood surveys.

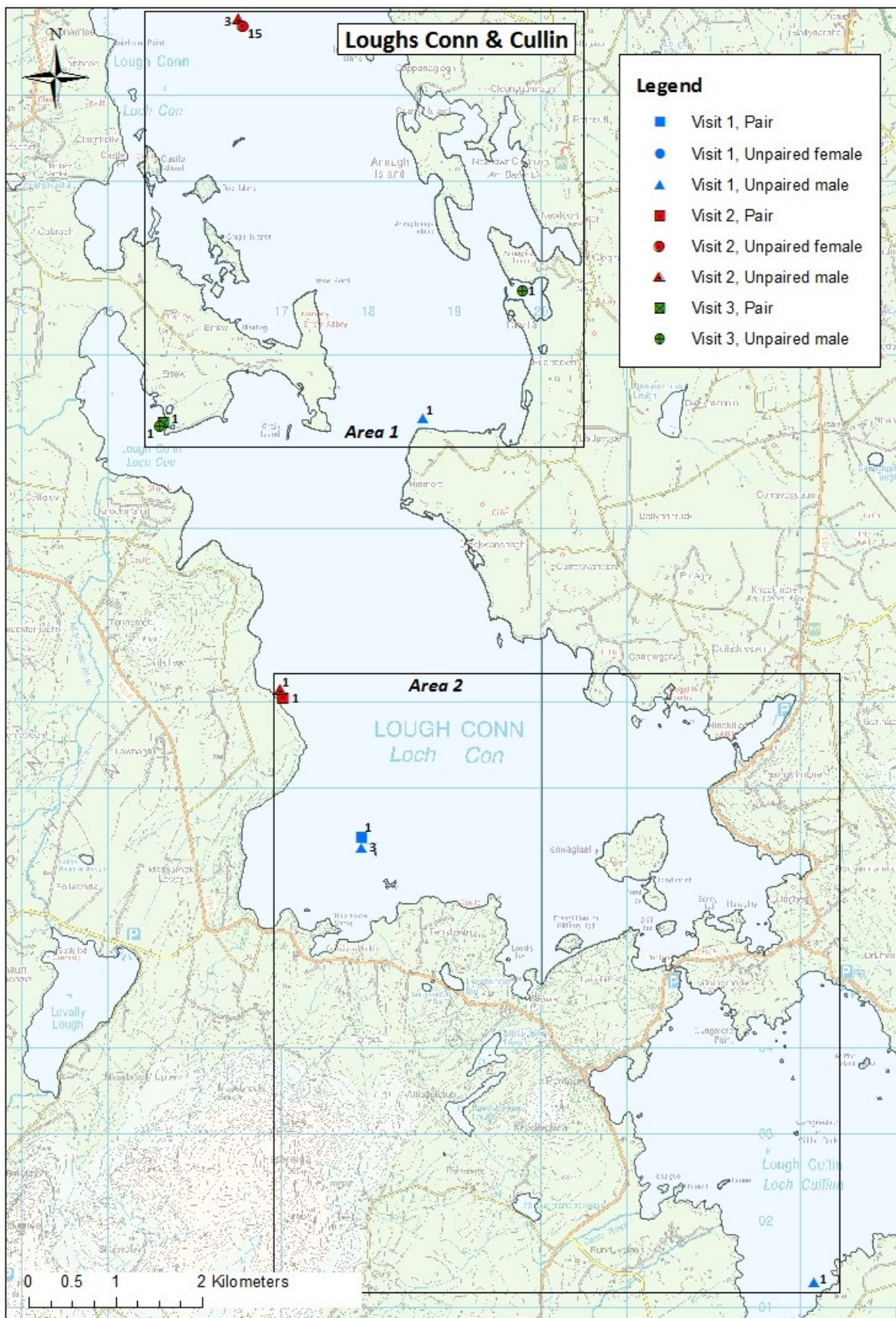


Figure 12. Overview of distribution of Common Scoter recorded during the breeding season on Loughs Conn and Cullin, 2012.



Figure 13. Common Scoter distribution in 'Area 1' on Loughs Conn and Cullin, 2012.

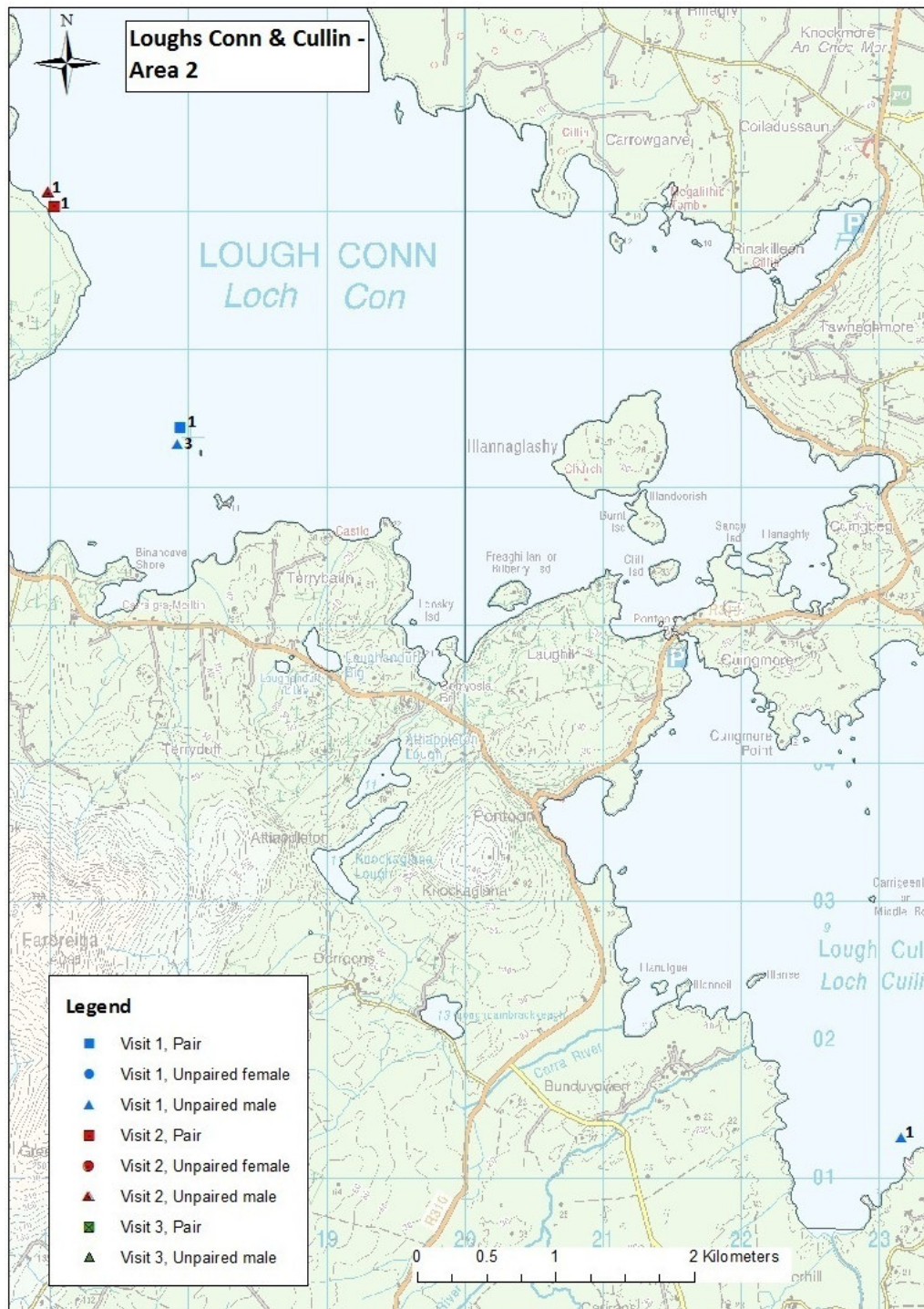


Figure 14. Common Scoter distribution in 'Area 2' on Loughs Conn and Cullin, 2012.

4.2.4 Lough Arrow

Pre-breeding census

At Lough Arrow five pairs of Common Scoter were recorded on the first visit and four on the second visit. The number of single adult male scoters dropped from eight on the first visit to two on the second visit. Single female scoters were not recorded on either visit.

Table 14: The number of pairs & individual birds recorded on Lough Arrow during visits 1 and visit 2.

Visit	Definite pair	Probable pair	Single adult male	Un-aged single male	Single female	Single immature female	Unsexed	Male: Female
One	4	1	8	0	0	0	0	2.6:1
Two	4	0	2	0	0	0	0	1.5:1

Pre-breeding Distribution

All the Common Scoter recorded on Lough Arrow were located within the northern half of the lake (Figure 15). Between visit one and visit two the Common Scoter became concentrated around Inishmore Island and the mainland.

Other observations

Two observations were made of Common Scoter associating with islands. One island was bare grazed and the other was wooded grazed.

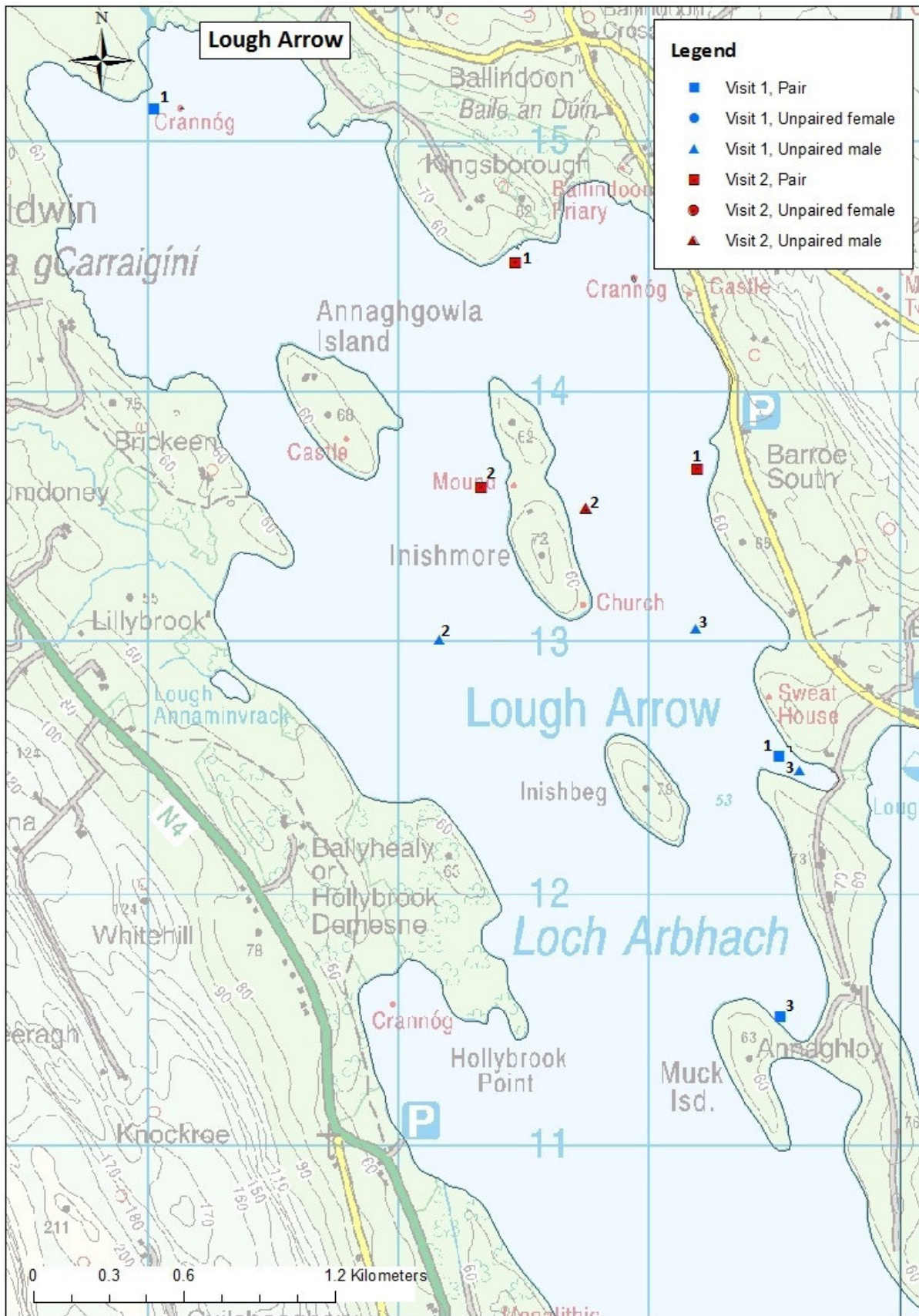


Figure 15. Distribution of Common Scoter recorded during the breeding season on Lough Arrow, 2012.

Brood survey results

From a total of five potential pairs, three broods, comprising a maximum of 10 ducklings were recorded from Lough Arrow (Table 15). Hatching success was 60% and productivity was 1.

Lough Arrow was surveyed three times during the brood survey. The first visit (13th July) found one small brood. Two broods were recorded on visits two and three (30th July & 13th August). Two broods and five ducklings were recorded on the third visit.

During visit two a brood of four un-aged ducklings was recorded and classified as a “probable” sighting. Given the age classes present on visit 3, it appears that this un-aged brood is one of the two broods counted. The brood of two ducklings which appear on visit one and two would be class IIb or IIc by the third visit and so are considered to be missing on the third count. The un-aged brood of four recorded in visit two is considered to be one of the broods recorded in visit three. This would mean that it was age class Ib during visit two.

Three single females were noted on visit one; two birds were flying and the other appeared to have a nest in the vicinity.

Table 15: Brood Survey results Lough Arrow

Visit	Age Class of ducklings						Total Ducklings	Total Broods	Single Females Without Broods	
	Class I			Class II						Class III
	a	b	c	a	b	c				
Visit 1	0	2	0	0	0	0	0	2	1	1,1,1
Visit 2	0	4**	4	2	0	0	0	10	3	0
Visit 3	0	0	0	4,1	0	0	0	5 (+5)*	2	0
Total number of ducklings hatched							10			
Total number of ducklings reaching class II							5			
Productivity (numbers reaching class II/potential breeding pairs)							1			
Maximum number of broods							3			
Hatching success (broods/potential breeding pair)							60%			

*duckling losses between visits.

**Un-aged ducklings recorded in visit 3 and estimated to be age class Ib in visit two.

4.3 Human Activities

Boat angling, shore angling, picnicking and walking occur at all the lakes surveyed. Boat angling was the most common activity as all the lakes are important game fisheries and the survey was carried out during the peak angling Mayfly season. Cruisers were recorded commonly on Lough Ree.

Disturbance to Common Scoter varied between sites. On Loughs Corrib, Arrow and Conn and Cullin, the impact from angling boats was judged to be low. On Lough Ree and the impact of cruisers and angling boats was judged to be moderate to high due to the volume of activity on this lake.

4.4 Predators

Predatory birds were recorded at all the sites. Those noted included Hooded Crow, Jay, Magpie, Raven and Gulls (Lesser Black-backed Gulls and Great Black-backed gulls). The numbers of Hooded Crow were considered to be higher than other potential avian predators.

Predatory mammals noted from the survey were two sightings of Mink from Lough Corrib and one from Lough Conn. An NPWS trapping programme caught three Pine Marten in the northern section of Lough Corrib during the pre-breeding survey.

4.5 Other waterbirds

Summary results of all waterbirds (other than Common Scoter) recorded at priority and non priority sites, including distribution maps, are presented in Appendices E to I. All data are stored in excel.

5. Discussion

5.1 Assessment of survey accuracy

5.1.1 Timing of survey

Pre-breeding survey

Based on studies in the Flow Country of Scotland (Underhill *et al.*, 1998), the optimal period for the pre-breeding census of Common Scoter is considered to be between 1st of May and 21st June (Gittings, 1995; Delaney & Gittings, 1996). However, since 1996, research on Lough Corrib (Tierney, 2001) identified the two week period between May 7th to 21st to be optimal. This period is judged to be when the greatest number of female scoters are visible. After this period Tierney found that the number of females on Lough Corrib began to decline, as they began nesting. All site visits in this survey were completed within the optimal survey period as recommended by Tierney (2001).

Brood survey

Tierney (2001) completed brood surveys between mid July and the 17th August following Partridge and Smith (1988). Tierney recommends the last two weeks in July and the first week in August as optimal for productivity estimates. Brood surveys were completed during this period in 2012. This gave good coverage of broods present and it was possible to easily track the progress of the separate broods through the age classes. This enabled a good estimate of productivity but gave no indication of fledging success. Fledging success can be judged by the number of ducklings recorded in Class IIc. This requires a later survey which ideally would be around the 17th of August. Lough Ree was surveyed on the 24th of August and ducklings reaching class IIc were recorded. The final brood survey on Lough Corrib was undertaken on the 29th of August and no adults or young scoter were recorded. This could indicate that: all broods were lost and the females left the area; all broods survived, fledged and then left the area with the accompanying females; or a combination of both scenarios.

5.1.2 Coverage

Pre-breeding survey

Coverage of all priority lakes was considered good during both pre-breeding visits.

Brood survey

Coverage was good during the brood surveys of Loughs Corrib and Arrow. Lough Ree had reasonably good coverage; although in the third survey conditions were poor with moderate to poor visibility for part of the day. However the results are considered accurate.

Survey conditions were poor for visit one at Lough Conn and Cullin and the north east shore of Lough Conn was not surveyed. Lough Conn had complete coverage during visit two. There is some possibility that scoter were missed during these visits.

5.1.3 Survey constraints

Pre-breeding survey

Weather in some instances caused survey difficulties as scoters were more difficult to detect sex and age in choppy waters. On Lough Corrib this proved only a problem in the areas of open water of the upper lough. Surveys in the sheltered bays of the east and west shores were less affected by weather.

Brood survey

Weather was the most significant survey constraint. In particular August was very windy and finding survey windows proved difficult. Weather conditions were very unstable and rapid changes in conditions meant that surveys had to be postponed at short notice. The inclement weather delayed final surveys of Lough Ree and Lough Corrib until the end of August which was outside the optimal period.

5.1.4 Effect of scoter movements on survey accuracy

Pre-breeding survey

All steps were taken to avoid double counting caused by scoter movement. Within the Oughterard area of Lough Corrib, double counting was a concern during the second visit. To resolve this possibility the area was counted again and an accurate count gained. It was of note during this re-visit that scoters had moved from an island in the morning to a feeding area in the afternoon. Common Scoter movements during surveys are likely to cause some double counting, however all steps were taken to reduce this error, by mapping the movements of scoters and recording group composition. Double counting was also discussed by Gittings (1995) and in 1996 the same area at Oughterard was re-surveyed to reduce double counting error (Delany & Gittings 1996).

Brood survey

The limited number of broods coupled with the range of age classes and brood sizes enabled easy identification of separate broods and enabled avoidance of double counting. Scoters are known to crèche chicks. Crèches are often of mixed ages and can be identified in this way. It is more difficult to identify crèches where chicks are the same age. No crèches were known or suspected during this survey.

5.2 The Irish Common Scoter population

5.2.1. The All – Ireland Breeding Population

While the Irish Common Scoter population has fluctuated since peak numbers of 150 breeding pairs in 1967 (Table 17), since 1995 the trend has been downward and numbers have never been as low as those recorded in this survey. While past declines at breeding sites appear to have been matched by a re-distribution of birds to new sites or increases at existing sites (Gittings, 1995; Tierney *et al.*, 2000) this is no longer the case. In 2012 Common Scoter were recorded at the same sites as in 1999 and breeding numbers declined at all sites except Lough Arrow.

The sharpest decline in the Irish Common Scoter population appears to have occurred between 1999 and 2012 (Table 16 & 17). Both the number of potential breeding females and the number of male scoter have declined by at least 50% in this period. While the All-Ireland male to female sex ratio has not changed substantially since 1999, a considerable change has occurred since 1995, with nearly 1.7 males present for every female, compared to 1.2:1 in 1995. This reflects the considerable increases in the sex ratio from 1995 to 2012 on Lough Conn and Cullin (1.3:1 to 6:1) and on Lough Ree (1.2:1 to 2.4:1). Lough Corrib has the most balanced ratio with 1.3 males to 1 female present. It appears that with a decline in the breeding population the male to female ratio becomes increasingly imbalanced. This trend occurred at Lough Conn and Cullin and is now apparent at Lough Ree. In 1987 the sex ratio amongst scoter on Lower Lough Erne was three males to one female and by 1993 there were no breeding pairs on this site (Partridge & Smith, 1988). The increasingly skewed ratio is largely driven by a reduction in the total females as opposed an increase in the male population which is a further indicator of a breeding population under stress.

A review of published adult sex ratio (ASR) estimates in birds showed the majority to be male skewed (Donald 2007). This is explained by lower survival of adult females, which may be due to a number of factors including the substantial energetic cost to the female during breeding and the risk of predation to incubating females. Donald found that ASR distortion (male skewed) in birds was significantly more severe in populations of globally threatened species than in non threatened species. While the relationship between ASR and bird population trends are not yet clearly understood, imbalances in ASR have implications for ecology, monitoring and conservation (Donald 2007).

Table 16: Population structure for the all Ireland population 1995-2012.

Year	Total Female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male: Female
1995	100	123	223	28	5	95	1.2
1996	93	111	224	34	16	77	1.2
1999	80	131	211	70	19	61	1.6
2012	39	67	106	30	2*	37	1.7

*Not including immature female recorded at Lough Corrib.

Table 17: Showing numbers[†] at all sites recorded since 1967 (based on Ruttledge, 1987; Gittings, 1995; Delaney & Gittings, 1996; Tierney *et al.*, 2000; Heffernan & Hunt 2004)

Year	Lower Lough Erne	Lough Conn/Cullin	Lough Ree	Lough Corrib	Lough Arrow	Total
1967	152					
1968		28-30				
1969	115					
1970	127					
1971	105	1+	P			
1972	80	1+				
1973	116					
1974	116		P			
1975	121					
1976	107					
1977	121					
1978	113		P			
1979	87					
1980	87					
1981	63			4+		
1982	72					
1983	51	53*		7		
1984	46		30+	7		
1985	11		30+	7		
1986	21			7		
1987	10	32	10-20	10		70
1988	7			P		
1989	9			P		
1990	6			P		
1991	2			P		
1992	5			P		
1993	0			P		
1994	0					
1995	0	31	39	30		100
1996	0	17	35	40		92
1997	0	P	P	P		
1998	0	P	P	P		
1999	0	7	32	36	5	80
2004	0	3				
2012	0	2	5	28	4	39

*Likely to be an overestimate. [†]P = present

5.2.2 Hatching success and Productivity

Brood survey results show that for a population of 39 breeding Common Scoter pairs in Ireland, 11 broods were produced (Table 18). Thus a minimum of 11 Common Scoter pairs successfully hatched young in Ireland in 2012.

Although a much higher number of breeding pairs were present at Lough Corrib, a similar number of broods were recorded at all three sites. Only five broods were produced on Lough Corrib from 28

breeding pairs, indicating that a minimum of five pairs successfully produced young at this site. Nonetheless, the highest numbers of ducklings were recorded at Lough Corrib. This may indicate that where scoter are successful in producing young on Lough Corrib, conditions are favourable for duckling survival and that the problem lies with successful breeding attempts, nesting, incubation and survival of recently hatched ducklings. It is also possible that from the potential breeding population of 28 pairs, many of these failed to breed or some were immature birds and did not attempt to breed.

Hatching success at an all Ireland level was 28%. Hatching success was higher at Lough Ree and Lough Arrow compared to Lough Corrib, however, the breeding population at these sites is very small (five pairs).

Productivity at an all Ireland level was 0.80 ducklings per breeding pair. At breeding sites in the Flow Country of northern Scotland, it was found that once productivity exceeded 0.60 the population tended to increase the following year (Mark Hancock, RSPB, pers. comm.). Regular pre-breeding and brood survey monitoring is required to assess if this is also the case at Irish breeding sites. It is of note that except for Lough Corrib, with 28 breeding pairs, productivity data are derived from breeding populations of 5 pairs only. Furthermore productivity data for Common Scoter tends only to show survival to age class II (c. 30-40 days) and does not account for mortality between age class II and fledgling. In addition Common Scoter survival at their wintering grounds is unknown. The numbers of Common Scoter being produced in Ireland and returning to breed may be very small and the level of recruitment, if any, from other breeding sites outside of Ireland is unknown.

Brood survey data from one year only is subject to the particular weather conditions, lake levels and other factors of that year, which may result in particularly poor or good breeding success. Further productivity data are clearly needed to properly assess population trends.

Table 18. Brood survey results from 2012.

Site	Potential pairs	No. of broods	Hatching success	Max. no. of ducklings	No. of ducklings reaching class II	Productivity [^]
Lough Corrib	28	5	18%	25	22	0.8
Lough Ree	5	3	60%	6	4	0.8
Lough Conn/Cullin	1	0	0	0	0	0
Lough Arrow	5	3	60%	10	5	1.0
Total	39	11	28%	41	30	0.8

[^] Estimated as number of Class IIa or older ducklings per breeding pair

5.3 Site Accounts

5.3.1 Lough Corrib

Lough Corrib became a known breeding site in 1981 and by 1987 ten pairs were recorded at this site. Between 1995 and 1999 the Corrib population fluctuated between 30 and 40 breeding pairs (Table 19). The 2012 survey found 28 pairs, indicating a possible downward trend in breeding numbers. The male to female sex ratio has become less balanced since the mid 1990's though is comparable to 1999.

The distribution of birds on Lough Corrib was similar in 2012 to that of 1995 and 1996. The population remains concentrated within the upper lough, with greatest breeding numbers in the areas of Doorus and Oughterard Bay.

Table 19: Scoter population structure on Lough Corrib 1995-2012.

Year	Total Female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male:female sex-ratio
1995	30	34	64	5	1	29	1.1
1996	40	38	78	8	10	30	1.0
1998	31	36	67	9	4	27+	1.2
1999	36	51	87	19	4	32	1.4
2012	28	36	65	10	3*	26	1.3

*This figure includes a single immature female which is not included in the total number of possible breeding pairs.

Pairing was observed on Lough Corrib on 15/16 May and Class Ib ducklings (circa 10 days old) were recorded on the first visit (13th July). With an incubation time of approximately 37 days it is estimated that incubation began around the 28th May with hatching commencing around the 3rd of July. This is slightly earlier than noted by Tierney (2001) where incubation was estimated to commence on 8th June 1997 and 2nd of June 1998 and 1999 with hatching on 3th July 1997 and 7th of July 1998 and 1999. In 2012 newly hatched ducklings (Class Ia) were recorded during the second visit (25th July) but no new broods were recorded on the 3rd visit (7th August). Tierney noted that all ducklings had gone from Corrib by the 18th, 19th and 26th August in 1997, 1998, 1999 respectively. No ducklings were found on the fourth survey (Aug 29th) in 2012.

Assuming that all females counted on Lough Corrib attempted to breed, hatching success was low at 17.8%, when compared to Tierney (2001). Using data from brood surveys over three years (1997-1999) Tierney estimated hatching success to be 34.7% (Tierney 2001). The difference in sample size and survey effort may have some bearing on these results.

Brood size on Lough Corrib ranged from one to nine ducklings. Two broods consisted of a single duckling, suggesting predation at the new duckling stage. Duckling counts by Tierney (2001) included several crèches, however none were known or suspected during this survey. Tierney had a mean brood size of 5.8 whereas this survey found a mean brood size of 5, albeit with a reduced sample size.

It was assumed by Tierney (2001) that once ducklings reached age class IIc they were likely to survive to fledgling. Tierney observed that low hatching success on Lough Corrib was followed by the disappearance of ducklings at a considerable rate from study areas as they mature (Table 20). In 2012 the number of ducklings hatched (age class Ia to Ic) was lower than found by Tierney (0.89 compared to 1+), however of those ducklings that hatched their estimated survival rates to age class II a and b, was similar to that found by Tierney (Table 20). This suggests relatively good survival between class I and II in 2012. There is no data for 2012 on those ducklings reaching age class IIc/III (Table 20) and presumed to have fledged, however given the low level of duckling loss during the vulnerable period age class I to IIb, survival to fledgling is considered likely. Productivity (at age class IIa and b) in 2012 was calculated at 0.8 ducklings per female, which is comparable to the other Irish breeding sites despite the lower hatching success.

Table 20: Duckling Productivity on Lough Corrib (ducklings per potential pair in relation to age category and year) between 1997 and 1999 (following Tierney, 2001) and in 2012.

Year	Age Category		
	Young (Ia to Ic)	Intermediate (IIa/IIb)	Old IIc/III
1997	1.76	0.29	0.14
1998	1.16	0.68	0.19
1999	1.19	0.61	0.39
2012	0.89	0.8	*
Mean	1.25	0.58	*

* The last brood survey of Lough Corrib was on the 7th of August and no ducklings were recorded. Given the lateness of the survey this cannot be taken as a negative result, therefore no result is presented for 2012 in this age class and mean data cannot be estimated.

In 2012, the Lough Corrib Common Scoter population appears to have been most vulnerable at the incubation and recently hatched duckling stage. Further, with only 11 broods produced from a potential breeding population of 28 pairs, this suggests that attempted breeding failed in a number of cases. It is also possible that not all 28 females were mature. Failed breeding can be linked to the condition of breeding females and where this is poor; inadequate feeding at breeding or wintering grounds may be a factor. Brown and Frederickson (1986) reported that White-winged Scoter *Melanitta fusca* relied on exogenous resources for pre-laying and laying periods.

Male Common Scoter leave for their wintering grounds post-breeding and as expected, no male Common Scoter were recorded during the brood survey. Tierney (2001) observed that no paired birds were present by early July on Lough Corrib with numbers of males declining from a peak at egg laying. During the first brood survey in the Oughterard area, female scoter were recorded both in groups and as lone individuals. The groups were likely to be failed breeders or transient immature birds. It is assumed that these scoters left for their wintering grounds after the brood survey as they were not subsequently counted. Some of the lone female scoters were observed feeding intensively and were likely to be incubating females from nearby nests. Subsequent surveys seemed to validate this assumption as broods were found in the same areas.

In 1996, when the Lough Corrib population was 40 pairs, Delaney and Gittings (1996) speculated that it was set to rise further. The lower hatching success and survival of new ducklings, compared to the late 1990's, together with a downward trend in breeding numbers and upward trend in the male to female sex ratio, at least since 1995 and 1996, indicates that this population may be declining. It is also of note that although the pre-breeding survey found that Common Scoter were concentrated in two parts of the lake, successful breeding was only recorded from one of these areas.

The reasons for the downward trend in breeding numbers and possible contraction in breeding range within Lough Corrib are unknown. Consideration of water quality data shows that despite peaks in total phosphate levels in the mid-nineties, chlorophyll a and total phosphate levels at Lough Corrib have been stable over the last 20 years. Adequate feeding for adult and young scoter is an important factor in breeding success. Changes in food supply, since research by Tierney in 1999 and 2000 (Tierney, 2001) is necessary to explore the influence of this factor. Predation by Mink *Neovision vision*, crows (Corvidae) and Pike *Esox lucius* may also influence breeding success. Mink has been present on Lough Corrib at least since 2000. While a mink trapping programme to protect breeding birds was introduced at Lough Corrib in 2012 the influence of mink predation since 2000 remains unknown. During the 2012 survey Hooded Crow were observed nesting on many islands on Lough Corrib. Inland Fisheries Ireland manage Pike stocks to ensure that large Pike are available for anglers. Large

Pike are known to predate on waterfowl ducklings and may cause scoter duckling mortality (e.g. Stronach, c.1977). In the last 12 years, the invasive Zebra Mussel *Dreissena polymorpha* and Curly Pondweed *Lagarosiphon major* have both colonised Lough Corrib and are likely to influence water quality. The invasive fish, Common Roach *Rutilus rutilus*, which is known to compete with Common Scoter for food, has been present at the site since the 1990's.

It is clear that the ecology of Lough Corrib is under increasing pressure from a number of factors. Those factors affecting Common Scoter breeding success may also be affecting other breeding waterbirds at this site. Declines in numbers of breeding gulls have been acute and are documented by McGreal (2011).

5.3.2. Lough Ree

Lough Ree became a known breeding site in 1984 when a minimum of 30 pairs were present. Between 1995 and 1999 the Lough Ree population showed a downward trend. In 2012, only five breeding pairs were recorded showing the most serious decline of all sites since the 1999 survey. The total number of individual scoter on Lough Ree in 2012 was 17 compared to 82 in 1999. The male to female ratio was 2.4 male scoters to one female.

In 2012 the breeding population remained focused on the northern half of the lake and particularly around the Black Islands, as found in the 1995 and 1996 surveys. However, there were no scoter records from Inchturk and Inchmore, just south of the Black Islands, an area which supported six pairs in 1995 and three pairs in 1996.

Table 21: Lough Ree population structure 1995-2012.

Year	Total Female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male: female
1995	39	48	87	11	2	37	1.2
1996	35	47	82	16	4	31	1.3
1999	32	50	82	29	11	21	1.6
2012	5	12	17	7	0	5	2.4/2.7

During the first brood survey of all breeding Common Scoter sites, the ducklings found at Lough Ree were older (age Class IIb) than at any other site. This suggests that pairing and incubation occurred earlier at Lough Ree than elsewhere. Age class IIb infers that the ducklings were around 30 days old and so incubation appears to have commenced on Lough Ree in mid May about two weeks earlier than on Lough Corrib.

Hatching success at Lough Ree was comparable to Lough Arrow and higher than at Lough Corrib. Brood size at Lough Ree was small ranging from one to three ducklings, with a mean brood size of two and no indication of crèches. In 1987 Partridge and Smith (1988) carried out a brood survey over three days (5-7 Aug) on Lough Ree and found 3 broods averaging 3.3 ducklings (range 2-4). At 0.8 ducklings (at class IIa) per breeding female productivity was similar to Loughs Corrib and Lough Arrow. It was estimated that 67% of hatched ducklings survived to age class IIc and were assumed to have fledged.

Lough Ree was the stronghold of the Irish Common Scoter population in 1995 with 39 pairs (Table 4). Between 1995 and 1999 there was a steady decline in the number of breeding females. In 2012 hatching success on Lough Ree was higher than at Lough Corrib and productivity was comparable.

However, between 1999 and 2012 the number of potential breeding females has declined by 84%. The small breeding population at Lough Ree coupled with an increasingly unbalanced sex ratio suggests that its future as a breeding site is less than secure.

The decline in the breeding population at Lough Ree has been dramatic and the reasons for this are unknown. Lough Ree is a naturally eutrophic lake and while the limited data available suggests water quality may be an issue at this site, further investigation is required. The invasive species Common Roach, Mink and Zebra Mussel are all present at Lough Ree. However, Mink have been present since the 1980's which is pre-colonisation of this site by Common Scoter. Both Roach and the Zebra mussel have been present since the mid 1990's. Further investigation is required to explain the cause of such a dramatic decline in breeding numbers at this site.

5.3.3. Loughs Conn and Cullin

Breeding was first recorded at Loughs Conn and Cullin in 1948 and by 1968 a maximum of 30 pairs was recorded. The population remained stable at around 30 pairs for the next 27 years until 1995 (Tierney 2001). By 1999 breeding numbers were severely diminished, with only seven pairs, compared to 17 in 1996 and 31 in 1995 (Table 5). A pre-breeding survey of this site in 2004 (Heffernan & Hunt 2004) confirmed a trend of decline with only three potential breeding pairs recorded. The 2012 survey recorded just one breeding pair and no broods. The male to female ratio has increased from 1.3:1 in 1995 to 6:1 in 2012 and at the same time breeding numbers have declined. With only one breeding pair found in 2012, and no evidence of successful breeding, the likelihood that this site will continue to be a regular breeding site appears low.

Table 22: Population structure for Loughs Conn and Cullin 1995-2012 based on Tierney (2001)

Year	Total Female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male:female sex-ratio
1995	31	41	72	12	2	29	1.3
1996	17	25	42	10	2	15	1.5
1997	6	11	17	7	2	4	1.8
1998	10	23	33	15	2	8	2.3
1999	7	23	30	18	2	5	3.3
2000	10	42	52	39	7	3	4.2
2004	3	24	27	21	0	3	8
2012	1	6	7	5	0	1	6:1

The collapse of the Loughs Conn and Cullin breeding scoter population from 30 pairs in 1985 to one pair in 2012 highlights a number of considerable ecological changes that have taken place in this 27 year period. It appears that the fisheries status of the two lakes remained stable up to the mid- to late 1980's. The first major change, in terms of fish stocks, was the apparent extinction of Arctic Charr *Salvelinus alpinus* by the mid- 1990's (O'Grady & Delanty 2001). This extinction followed a doubling of the total phosphorus load between 1980 and 1990 (McGarrigle *et al.* 1993) resulting in filamentous algae blooms.

These eutrophication events in Lough Conn probably gave rise to the second major change in fish stocks between 1990 and 2001. This change relates to the population structure of trout, with significantly larger fish occurring in the stock with no change in their longevity (O'Grady & Delanty

2001). This was coupled with a decline in trout numbers in Lough Conn, probably due to a limited survival of young trout as a result of a decrease of their targeted food items.

In the late 1990's and early 2000's, both Lough Conn and Cullin populations of Cyprinids increased exponentially and, by the mid- 2000's, Lough Cullin had the largest density of Common Roach per fishing effort (Catch per unit effort - CPUE) in the country (Inland Fisheries Ireland, 2010).

The first recorded sightings of Mink are from 2000, which is post the most dramatic fall in breeding numbers at this site. It is possible that Mink were present pre-2000, however none were recorded in the 1988 Mink survey (Small, 1988) and there are no incidental records of Mink gathered during other species surveys, according to data held by Biodiversity Ireland.

It appears that the major decline in scoter populations between 1995 and 1999 coincides with the peak of the serious deterioration of water quality. It is not known what contribution the occurrence and subsequent Roach population explosion has had on the scoter decline. The presence of Mink is a well-known threat to ground nesting waterfowl and its presence would inevitably put further pressure on already declining stocks.

5.3.4. Lough Arrow

Successful breeding was first reported on Lough Arrow in 1999, when five pairs were recorded (Tierney 2001). Five pairs were again recorded during this survey. Brood survey results show hatching success at 60% and productivity at one duckling per breeding pair. While the male to female sex ratio is unbalanced in 2012, the number of breeding pairs has remained stable. More data are necessary to assess the stability of this population.

5.4 Factors Influencing Common Scoter populations in Ireland

Research into the Lower Lough Erne population provided the first insights into the ecology of the Irish Common Scoter population and the reasons for its decline at this site. Partridge and Smith (1988) concluded that water pollution and mink predation were probably largely responsible for declines at Lower Lough Erne. Specifically problems of lack of food for young ducklings, poor feeding conditions, predation of nesting females by Mink and the spread of Common Roach, were described. Following Partridge and Smith a number of potential factors influencing the Irish Common Scoter population were discussed by Gittings (1995) and between 1997 and 2000 Tierney (2001) completed research into aspects of the biology of Common Scoter on Lough Corrib. While existing reports and research provide further information into the Irish Common Scoter population, there is a dearth of evidence linking Common Scoter population change and decline to any one of more factors. Those factors which may be responsible for changes to and declines in the Irish Common Scoter population are considered below.

5.4.1 Changes in water quality

The changes in and reduction of species diversity in aquatic animal and plant assemblages in response to pollution, especially organic pollution and eutrophication, are well documented (*e.g.* Clabby *et al.* 2008). Changes in water quality at Common Scoter breeding sites can be measured in terms of trophic status or by using more specific parameters such as Chlorophyll A and Total Phosphorus. Common Scoter breed in both oligotrophic and eutrophic lakes and as found by Gittings (1995) and Tierney

(2001), the use of trophic status trends is unlikely to detect any meaningful changes in lake water quality with respect to its suitability or otherwise for breeding Common Scoter. Nonetheless, at Lower Lough Erne it was noted that prior to the extinction of Common Scoter this site became strongly eutrophic (Partridge and Smith, 1988). At Loughs Conn and Cullin the major decline in scoter populations between 1995 and 1999 appears to coincide with the peak of the serious deterioration of water quality at this time (McGarrigle *et al.* 1993). The link between water quality changes, using specific parameters such as Chlorophyll A and Total Phosphorus, and Common Scoter declines, requires further investigation.

5.4.2 *The introduction of Common Roach*

Roach has been present at all Common Scoter breeding sites, except Lough Arrow since the mid 1990's. At Lough Arrow it has been present since 2007. Roach can target a similar prey base to Common Scoter, potentially affecting the feeding resource available to scoter populations. Since their introduction numbers of Roach have been relatively low and stable at all Common Scoter sites, except Loughs Conn and Cullin where an explosion of the Roach population occurred in early 2000. Numbers are now declining. The impact of Roach requires remains a possible factor in local Common Scoter declines.

5.4.3 *Predation by Mink*

Predation of ground nesting birds by Mink can have disastrous effects on breeding success (eg Craik, 1995). While Mink was absent from much of the West of Ireland in 1988 (Smal, 1988), it is now present in all western counties and was recorded at Lough Corrib in the 1990's (Fairley, 2001) and at Loughs Conn and Cullin in 2000 (Hawkins, 2010). Mink were present at Lough Arrow prior to 1999 (Biodiversity Ireland website) when breeding was first recorded at this site and were present at Lough Ree in 1980 (Biodiversity Ireland website) before the population peaked at this site, in 1996. Partridge and Smith (1988) speculated that a strongly male biased sex ratio may be an indication of mink predated nesting females. Mink control is carried out by the National Parks and Wildlife Service at all Common Scoter breeding sites as a precautionary measure. Regular monitoring of the Common Scoter breeding success together with targeted mink control may establish the link between the two. The use of nest cameras to identify predators at Common Scoter nest sites would clarify this issue further.

5.4.4 *Availability of suitable nesting habitat.*

While studies to date have not linked population declines to availability of suitable nesting habitat, Gittings (1995) found that Common Scoter on Lough Corrib, showed a significant preference for grazed islands. Research by Tierney (2001) found that Common Scoter, also on Lough Corrib, associated strongly with islands which had good cover along their margins, but were grazed so that the cover did not become too rank and dense. This type of habitat depends on the continued practice of stocking the islands. The availability of such habitat may be a factor in their breeding success. It is of note that at Lough Ree, a lack of grazing on the islands has been observed.

5.4.5 *Predators (other than mink)*

Hooded Crows, large Pike and large gulls (*Larus* spp.) are known to predate waterbird eggs and ducklings. Hooded Crows is a well known predators of bird nests, commonly taking eggs and young

(Svensson & Grant, 1999). In a four year experiment on Lough Carra, Stronach (c. 1977) found that controlling predator numbers, in particular Hooded Crows, resulted in increased breeding success and raised recruitment rate in the Mallard *Anas platyrhynchos* population. Predation of Mallard ducklings by Pike was recorded on Lough Carra (Stronach, 1977). Pike is an introduced species and is a managed fish stock by the Inland Fisheries Ireland. Part of this management is to retain large Pike in the lakes for anglers. An increase in the size and numbers of this predatory fish may have consequences for the dwindling scoter populations and this impact is worth further consideration.

Partridge and Smith (1988) document a probable record of predation of Common Scoter by Lesser Black-backed Gull *Larus fuscus* on Loughs Conn and Cullin. Large gulls are another well known predator of other nesting birds. However at all sites except Lough Ree, colonies of nesting Lesser Black-backed Gull, Great Black-backed Gull *Larus marinus* and Herring Gull *Larus argentatus*, have all suffered serious declines. Predation of Common Scoter by Lesser Black-backed Gulls at Lough Ree may occur but is not likely to have caused the dramatic decline in breeding numbers at this site.

5.4.6 Gull protection

Scottish Natural Heritage carried out biodiversity studies in the mid 1970's and found that "All duck species had more hatching success when nesting in a gullery than outside". A preference was shown for ducks to seek the "protection" of a Black-headed Gull *Chroicocephalus ridibundus* colony above that of a large gull colony, but both were seen as preferable to no "gull protection" at all. It presumably occurred because the gulls, whilst not themselves serious predators on hidden duck clutches, kept out other species that were known to predate duck eggs (SNH, 2010).

The most recent survey of breeding gulls on Lough Corrib found just one large Black-headed gull colony (349prs) in Oughterard Bay, a core breeding area for Common Scoter at least since 1995. On Lough Conn when the population was stable during the 1980's, suspected nesting islands for Common Scoter included Seagull Island which had a "large colony of Common Gulls" and Glass Islands which had "a large colony of Lesser Black-backed Gulls" (Partridge & Smith, 1988). The most recent gull survey of Lough Conn revealed no record of any large colony of Common Gull *Larus canus* or Black-headed Gull (McGreal, 2011).

With the decline in large colonies of breeding gulls at Common Scoter breeding sites, it is possible that Common Scoter nest sites have become more vulnerable to predation. Given the limited information available on where Common Scoter nest, the influence of this factor is unknown.

5.4.7 The introduction of Zebra Mussel and Curly Pondweed

The invasive Zebra Mussel is present at all Common Scoter breeding sites. The Zebra Mussel was recorded at Lough Ree in 1995 and has been recorded at all other breeding sites since early 2000. Another invasive species, Curly Pondweed is now present at Lough Corrib. Changes to the ecology of the lakes where Common Scoter breed, due to the continued presence of Zebra Mussel and other invasive species, are unknown and may have consequences for the recovery of the Common Scoter breeding populations.

5.4.8 Disturbance

Disturbance to breeding birds can lead to poor breeding success and can increase the risk of predation, as adults leave the nest or young. Anthropogenic disturbance was recorded at all Common Scoter

breeding sites in 2012, however, except at Lough Ree impacts were judged to be low. Potential disturbance activities include angling, cruise boats, visitors to the lake islands. It is of note that the pairing up of Common Scoter coincides with the height of the Mayfly season when angling activity is at its most intense. One of the most intensively used areas on Lough Corrib is Oughterard Pier and Bay which was also where the greatest concentration of scoter and broods were found during the 2012 survey. More detailed studies are required to identify the potential impact of this factor on breeding success.

5.5. Additional factors influencing Common Scoter population declines.

5.5.1 Common Scoter ecology

Together with the pressures at their breeding sites aspects of Common Scoter ecology also influence their chances of survival. Common Scoter nest on the island margins and so are vulnerable to summer flooding (Hancock, 2012), potentially leading to nest failure. The male Common Scoter tends to depart shortly after breeding (Tierney, 2001) and should nest failure occur due to flooding, predation, or some other factor, there may be no opportunity to re-lay. Further, nesting and brood rearing is undertaken by the female alone (Perrins and Cramp, 1977), and requires considerable expenditure of energy. Inadequate feeding at this critical time may affect migration and lead to poor winter survival of adult females. Loss of females during migration or at their wintering grounds, may help to explain the extreme sex ratios noticed at sites experiencing population decline.

5.5.2 Wider ecological changes at Common Scoter breeding sites.

During the brood survey of Lough Corrib five broods of Common Scoter were counted during the survey of the Oughterard – Ard area. At this time it was noticeable how few other waterbirds and broods were present. Only five broods of Mallard were counted during the same survey period. Before the Lower Lough Erne extinction of scoter Patridge and Smith (1988) made the observation that the Lower Lough Erne breeding bird population in the 1960's was large with nearly 200 pairs of Tufted Duck *Athya fuligula* as well as 152 pairs of scoter. By 1987 there were less than 20 pairs of either on the lake. Further work should be carried out into the general ecology of all Common Scoter breeding sites, including comparison of ancillary data collected during the 2012 survey, with that of previous lake surveys.

The decline in the Irish Common Scoter population is likely to reflect a general deterioration in the ecological quality of their breeding sites. These ecological changes are likely to affect the breeding performance of other ground nesting waterbirds. McGreal (2011) has documented declines in breeding gulls at Lough Corrib and at Loughs Conn and Cullin, while Meehan *et al.* (2009) has documented declines in waterfowl populations on Lough Carra, with similar declines likely to have occurred at other west of Ireland lakes.

5.5.3 Global Climate Change

The Common Scoter is at the edge of its breeding range in both the UK and Ireland and both populations are showing a decline in breeding numbers. With colonisation of these islands only occurring in the last 160 years it is possible that the populations here are particularly vulnerable to

changes in conditions and in particular to climate change. The Monarch Project (*Walmsley et al., 2007*) predicted a significant loss of climate space for Common Scoter by the 2020's and projected the potential loss of all climatically suitable areas by the 2080's. This suggests that climate change may become a considerable factor in the conservation of the Common Scoter.

6. Conclusions & Recommendations

Several changes in the breeding population of Common Scoter have taken place since the species first bred in Ireland in 1905. Until now it has been possible to speculate about re-distribution of breeding numbers as the national population has appeared stable. However the 2012 survey shows a clear decline in breeding numbers since 1999 with no new breeding sites recorded in the same period.

The reasons for past changes and current declines in the Irish Common Scoter population are difficult to establish. The lack of any clear evidence explaining past and current changes prevents anything other than further speculation. The fact that other breeding birds at Common Scoter sites are in decline, suggests a wider problem of changes to lake ecology. While predation is undoubtedly a factor and may become critical as populations dwindle, predation as the cause for local and dramatic declines would seem less clear.

It is important to establish if there is any fundamental ecological factor resulting in the Common Scoter declines, such as changes in water quality and in food supply, or at least to exclude these factors, based upon evidence. The need for the coordination of all stakeholders is also an imperative to ensure that management actions take into account both anthropogenic and ecological factors.

Factors outside of Ireland's freshwater habitats must also be considered. The survival of the Irish Common Scoter population during migration and at their wintering grounds, is unknown and this may also be critical to Irish breeding population trends.

It is clear that steps should be taken to protect the breeding population of Common Scoter at Lough Corrib and Lough Arrow and to improve breeding numbers at Loughs Conn and Cullin and Lough Ree. It is also clear that investigation into the reasons for the recent and past declines in breeding numbers is required. To achieve this, the following are recommended:

Management Actions

- A Species Action Plan should be prepared for this rare and vulnerable breeding species. In the preparation of this plan there is a clear need for all those involved in the management of the lakes to be consulted to ensure that a coordinated management approach can be developed.
- Mink are present at all the lakes and are known to predate waterfowl. It is important to continue and where possible improve the mink control programmes at all Common Scoter breeding sites.
- Consider the culling of Hooded Crows, where they have established territories within Common Scoter breeding areas.

Monitoring and methodology

- Common Scoter surveys (pre-breeding and brood) to be carried out annually if possible or at intervals of no more than three years. An appropriate monitoring period should be determined with regard to the key objectives of any forthcoming conservation plan.
- Methodology: Two surveyors within the optimal Period (7th-21st May) for the pre-breeding survey. The brood survey should be carried out three times during the period 14th July to 7th August to determine hatching success and productivity and ideally again around 17th August to determine numbers surviving to fledging stage.

- For more effective monitoring all breeding bird data collected on the lakes should include pair status and sex of the birds.

Research

- Research into water quality: Attention should focus on a number of specific water quality parameters such as total phosphorus and chlorophyll A levels and changes in these parameters since 1980.
- Research into water levels to determine if the summer lake levels are greater now than in the 1970's and 1980's. Attention should focus on any increased incidence in rapid lake level rises during the breeding season.
- Research into scoter food preferences and availability.
- Research into invasive species impacts.
- Analyse breeding bird data from the 1970's and 1980's to identify trends at the scoter loughs.
- Camera placement in nests and GPS/VHF radio tagging of scoter during brood rearing would help to identify the causes of nest failure and would help to inform suitable management prescriptions.
- GPS/Satellite tracking to assess winter survival of Irish breeding Common Scoter and fidelity to Irish breeding and wintering sites.

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8. Appendices

Appendix A. Known, potential and possible Common Scoter breeding sites in Ireland.

Site	History*	2012 Survey
Known breeding sites		
Lough Conn/Cullin	3 pairs in 2004	PRIORITY SITE
Lough Corrib	32 pairs in 1999/ 19 in 2000	PRIORITY SITE
Lough Ree	21 pairs in 1999	PRIORITY SITE
Lough Arrow	3 pairs in 1999/ 6 in 2000	PRIORITY SITE
Historical breeding sites		
Lower Lough Erne	5 pairs in 1992, nothing since	RSPB NI SITE
Lough Carra	1 record in last 12 years	NON-PRIORITY
Potential breeding site		
Lough Mask	Summer record only	NON-PRIORITY SITE
Lough Melvin	Summer record only	NON-PRIORITY SITE
Lough Derg	Summer record only	Not surveyed
Lough Ennell	Summer record only	Not surveyed
Lough Assaroe	Summer record only	Not surveyed
Possible breeding sites		
Lough Key	Suitable habitat only	NON-PRIORITY SITE
Lough Gara	Suitable habitat only	NON-PRIORITY SITE
Lough MacNea Upper and Lwr	Suitable habitat only	Not surveyed
Lough Gill	Suitable habitat only	NON-PRIORITY SITE
Lough Allen	Suitable habitat only	Not surveyed
Lough Owel	Suitable habitat only	Not surveyed
Lough Sheelin	Suitable habitat only	Not surveyed

*Based on most recent data available for the site.

Appendix B. List of consultees in the selection of non-priority sites for survey.

NPWS

David Tierney

Helen Carty

William Cormacan

Niall Cribbon

John Higgins

Denis Strong

Ger O Donnell

Padraig O Donnell

Aongus O Donaill

John Mathews

Lee Mc Daid

Maurice McDonell

Tim Roderick

Fiona Wheeldon

Pat Warner

Birdwatch Ireland

Heather Bothwell

Martin Enright

Kevin Collins

Alex Copeland

John Davis

Frances and David Farrell

Stephen Heery

Kealin Ireland

Paul Andreas Kelly

Padraig Roche

Ralph Sheppard

Ray Wills

Appendix C. Survey Instructions

The aim of the 2012 survey is to complete a re-survey of all core breeding sites for Common Scoter during the optimal survey period 7th to 21st May. Full coverage of all core sites at least once between the 7th and 21st May must be achieved. A sample of non-priority sites should also be surveyed. The 2012 survey will use the methods documented by Gittings, 1995 and Tierney, 2001, for consistency in survey results.

1. Surveys can take place at any time during the day. Surveys should not be undertaken in periods of poor visibility, caused by rain or high wind. Wherever possible, surveys should not be undertaken in winds of force 4 or greater.
2. A route should be taken that allows good views of the open water and shore line of lake and islands. These should be surveyed systematically, following the shore line and going around each island in turn. Open water and shore line should be scanned continually. Ensure boat speed is slow enough to allow scanning. Boat speed will vary depending on the weather conditions.
3. Double counting – plan an optimum route so that areas which scoters move between, if known, are covered in a manner that allows such movements to be observed. Where time allows and in certain situations (eg when groups of identical composition are seen in adjacent areas) double back and check that scoters have not moved from previously counted areas. The Conservation Ranger may have some advice regarding areas where double counting is likely, Gittings (1995) refers to Lough Ree be being tricky where there are scoter movements between Black Islands and the adjacent east shore.
4. If scoters move during survey, record flight direction and where they land if observed.
5. Establishing pairs - When mixed groups are seen, establish the occurrence of paired birds by watching the group for a period of time and note persistent close associations between particular male and female.
6. Record Common Scoter under the following headings:

Category	Description
Pairs	The number of Common Scoter definitely seen in pairs (see note 5 above)
Probably pairs	The number of Common Scoter probably seen in pairs
Males	The number of single adult male Common Scoter (older than 1 year)
Immature males	The number of single immature male Common Scoter (birds in first summer)
Unaged males	The number of single male Common Scoter where it could not be aged .
Females	The number of single female Common Scoter . This will include adult and immature birds.
Un-sexed	With poor views it may not be possible to determine the sex of the bird.
Grid Ref	Give 6 figure grid reference for any scoters recorded. Use Irish National Grid
Associating	Note where Common Scoter is associating with an island ie <i>if they either swam out from its shore or swam into its shore</i> .
Behaviour	Feeding/Loafing/Preening/Mating/Display/Distracted/Other

HABITAT

1. Islands are a priority in terms of habitat recording. Record habitat on islands of <0.5 Ha under the categories listed below. Record habitats using the codes listed below and note codes directly onto field maps. Where possible please note type of grazing (sheep/cattle/goats) and any other information in terms of habitat use on the islands.

2. Mainland - Record terrestrial habitats within 10 m of shore only. For mainland habitats indicate major changes of habitat only. Detailed habitat notes of mainland shore will distract from main focus of survey, so general notes only should be taken.

Category	Description	CODE
Wooded	Whole island covered in woodland – no grazing.	WD
wooded grazed	Islands with belts of trees along at least part of their periphery/ patches of trees and with evidence of cattle or sheep grazing activity.	WG
bare grazed	Evidence of being grazed by farm islands and without any patches of woodland or scrub.	BG
scrub covered	Completely covered in scrub vegetation. No grazing.	SB
moorland	Most of the island covered in moorland (heath covered)	ML
rocky	Bare rock or sparse low vegetation	RY
Reedbed	Distinct areas of reedbed.	RB
Other		

OTHER WATERBIRDS

Other waterbirds are to be recorded wherever possible, though not to the detriment of the coverage for Common Scoter. For other waterbirds record the following:

- Record number, sex, age, location and breeding status where possible.
- Use standard BTO species codes.
- Note breeding evidence following standard codes from Breeding Bird Atlas (attached below).
- For colonies of gulls and terns record location on map/take GPS grid reference where possible and give an estimate of colony size with approximate no. of individuals or Apparently Occupied Territories (AOT) or presence/absence of colony.

PREDATORS:

Record the presence of any mammalian e.g. Mink, fox, stoat, pine marten Or avian predators e.g. raptors, magpie, hooded crow, raven,

HUMAN ACTIVITY/IMPACTS:

Record activities such as: Angling, sailing, wind surfing, shore angling, walking on islands, power boats, jet skis or specify other. Mark activity on map (generally), or give GPS reference where possible where there is a concentration of activity.

Grade the impact (see below) of activities observed on Common Scoter where/if they occur. If time permits note the impact of any activities observed on other birds also (e.g. disturbance at tern colony etc.)

High impact – birds took flight and left area/ remained in flight agitated above colony.

Medium impact – birds took flight for short period but returned to same location

Low impact – birds became alert but did not move location

Appendix D. Brood Survey Method

Survey Method

The duckling census is carried out by systematically covering the lake and island shorelines. In the case of Lough Corrib (due to the size) the brood census will only cover areas known as suitable for ducklings. The scoter population breeding on Lough Corrib can be divided into two main populations: the Oughterard population and Dooras population.

When ducklings are encountered in the field they should be aged by plumage class (Table 1; following <http://www.npwrc.usgs.gov/resource/birds/ageduck/index.htm>). The ages of the broods can be used to track individual broods over the course of the surveys.

Frequency

Where only one visit is possible due to weather constraints this should take place between mid July and August 17th. This will not determine productivity but will just confirm breeding.

The brood survey should be carried out three times during the period 14th July to 7th August to determine hatching success and productivity and ideally again around 17th August to determine numbers surviving to fledging stage. There should be at least one week between surveys.

Other Data

The habitat of associating islands to be noted

Ancillary waterfowl data to be noted where collection of such data doesn't interfere with the primary survey.

Table 1 - Development of a Wild Duckling as Viewed Under Ideal Conditions

Plumage Class	Sub-Class	Description
I. Downy Young - No Feathers visible	a	" <i>Bright ball of fluff</i> ". Down bright. Patterns distinct (except diving ducks). Body rounded; neck and tail are not prominent.
	b	" <i>Fading ball of fluff</i> ". Down colour fading, patterns less distinct. Body still rounded; neck and tail are not yet prominent.
	c	" <i>Gawky-downy</i> ". Down coloured and patterns faded. Neck and tail becomes prominent. Body itself becomes long and oval.
II. Partly Feathered - as viewed from the side	a	" <i>First feathers</i> ". First feathers show on side under ideal field conditions. Stays in this class until side view shows one-half of side and flank feathered.
	b	" <i>Mostly feathered</i> ". Side view shows one-half of side and flank feathered. Primaries break from sheaths. Stays in this class until side view shows down in one or two areas only (nape, back or upper rump).
	c	" <i>Last down</i> ". Side view shows down in one or two areas only (nape, back or upper rump). Sheaths visible on erupted primaries through this class. Stays in this class until profile shows no down.
III. Fully Feathered - in profile		" <i>Feathered-flightless</i> ". No down visible. Primaries completely out of sheath but not fully developed. Stays in this class until capable of flight.

Appendix E. Environmental and survey data for priority sites.

Table 1. Lough Corrib. Note for some dates on Lough Corrib two boats were out on the same survey day.

Site	Date	Start	End	Wind	Direction	Cloud	Rain	Visibility	Water Surface	Visit No.
Lough Corrib	06.05.12	09:00:00	17:50:00	Calm	Var	0-33%;	None	Good	Calm	1
Lough Corrib	08.05.12	09:55:00	18:20:00	Breezy	NW	67-100%	Showers	Good	Choppy	1
Lough Corrib	08.05.12	10:00:00	17:22:00	Breezy	NW	67-100%	Showers	Good	Choppy	1
Lough Corrib	09.05.12	09:45:00	17:30:00	Breezy	NW	67-100%	None	Good	Slightly choppy	1
Lough Corrib	09.05.12	10:00:00	17:35:00	Breezy	NW	67-100%	None	Good	Slightly choppy	1
Lough Corrib	10.05.12	10:00:00	16:55:00	Light	NW	67-100%	Showers	Moderate	Calm	1
Lough Corrib	10.05.12	13:00:00	16:15:00	Light	NW	67-100%	Showers	Moderate	Calm	1
Lough Corrib	11.05.12	09:30:00	12:30:00	Breezy	NW	67-100%	None	Moderate	Slightly choppy	1
Lough Corrib	15.05.12	09:20:00	17:20:00	Breezy	NW	67-100%	Showers	Good	Choppy	2
Lough Corrib	15.05.12	10:00:00	17:30:00	Breezy	NW	67-100%	Showers	Good	Choppy	2
Lough Corrib	16.05.12	09:15:00	17:30:00	Light	NW	67-100%	Showers	Moderate	Slightly choppy	2
Lough Corrib	16.05.12	10:20:00	19:00:00	Light	NW	67-100%	Showers	Moderate	Slightly choppy	2
Lough Corrib	21.05.12	09:30:00	16:20:00	Light	NE	34-66%,	None	Good	Calm	3

Table 2: Lough Ree, Lough Arrow, Lough Conn and Cullin

Site	Date	Start	End	Wind	Direction	Cloud	Rain	Visibility	Water Surface	Visit No.
Lough Ree	08.05.12	09:10:00	16:50:00	Calm	E	34-66%,	None	Good	Calm	1
				Breezy	NE	0-33%;	None	Good	Slightly choppy	1
Lough Ree	09.05.12	09:25:00	17:10:00	Calm	NE	0-33%;	None	Good	Calm	1
				Light	NE	67-100%	None	Good	Slightly choppy	1
Lough Ree	10.05.12	09:45:00	16:00:00	Breezy	NW	67-100%	Drizzle	Moderate	Choppy	1
Lough Ree	16.05.12	09:20:00	17:00:00	Light	SW	34-66%,	None	Good	Slightly choppy	2
				Light	SW	67-100%	None	Good	Slightly choppy	2
				Light	SW	67-100%	None	Good	Calm	2
Lough Ree	18.05.12	09:35:00	17:40:00	Light	NE	34-66%,	None	Good	Slightly choppy	2
				Light	NE	67-100%	None	Good	Slightly choppy	2
				Light	NE	67-100%	None	Good	Calm	2
Lough Ree	19.05.12	09:25:00	15:20:00	Breezy	E	67-100%	None	Good	Slightly choppy	2
Lough Conn/Cullin	08.05.12	10.10:00	18:00:00	Light	NE	67-100%	None	Good	Slightly choppy	1
Lough Conn/Cullin	09.05.12	10.10:00	18:00:00	Light	NE	67-100%	None	Good	Slightly choppy	1
Lough Conn/Cullin	17.05.12	09.30.00	17.30.00	Calm	SW	34-66%,	None	Good	Calm	2
Lough Conn/Cullin	24.05.12	08.00.00	15.00.00	Calm	S	34-66%,	None	Good	Calm	3
Lough Arrow	07.05.12	09:20:00	16:00:00	Light	SW	67-100%	None	Good	Slightly choppy	1
Lough Arrow	14.05.12	09.00.00	16.00.00	Breezy	W	67-100%	Showers	Moderate	Slightly choppy	2

Appendix F: Ancillary data for priority sites.

Waterbirds (other than Common Scoter)

Table 1a. Other waterbirds recorded on Lough Corrib: Visit 1 (survey of entire lake)

Waterbirds	Pair	Single Female	Single Male	Individual	Young
Cormorant				63	1
Coot	1			4	
Common Sandpiper	14				
Gadwall	7	1	5		
Great Crested Grebe	1			7	
Greylag Goose	5			103	24
Grey Heron			1	13	
Lapwing	8				
Little Grebe				2	
Mallard	64	9	197	1	11
Moorhen				12	
Mute Swan	23			140	
Oystercatcher	2			1	
Red-breasted Merganser	43	6	37	1	
Ringed Plover	1				
Teal			1		
Tufted Duck	76	4	47	20	
Whimbrel				76	
Total	245	20	288	428	36

Table 1b. Other waterbirds recorded on Lough Corrib: Visit 2 (survey of upper Lough only)

Waterbirds	Pair	Single Female	Single Male	Individual	Young
Cormorant				13	
Coot	3			4	
Common Sandpiper	14				
Curlew	3				
Gadwall			3		
Great Crested Grebe	1			1	
Greylag Goose				103	48
Grey Heron			2	11	
Lapwing	6				
Little Grebe	1			10	
Mallard	57	13	132		29
Moorhen				1	
Mute Swan	9			18	
Redshank	1				
Red-breasted Merganser	28	5	24	3	
Tufted Duck	32	1	21		
Whimbrel				15	
Total	277	19	182	179	77

Table 2. Other waterbirds recorded on Lough Ree

Waterbirds	Pair	Individual
Cormorant	50	
Coot		50
Curlew		Present
Little Egret	2	1
Great Crested Grebe	1	
Grey Heron		>10
Lapwing	11	
Little Grebe	1	
Mallard		Present
Mute Swan		105
Redshank	4	
Red-breasted Merganser	6+	
Shoveler		5
Tufted Duck		100+
Whimbrel		Present
Total	65	671

Table 3. Other waterbirds recorded on Lough Conn/Cullin

Waterbirds	Pair	Single Male	Individual	Young
Cormorant			10	
Common Sandpiper	8			
Great Crested Grebe			2	
Grey Heron			4	
Lapwing	6		3	
Mallard	20	8	2	
Mute Swan	7		4	
Redshank			1	
Red-breasted Merganser	2			1
Tufted Duck	5			
Whimbrel			3	
Total	48	8	29	1

Table 4. Other waterbirds recorded on Lough Arrow

Waterbirds	Pair	Individual	Young
Cormorant		4	
Coot		16	
Great Crested Grebe	1	6	
Grey Heron		3	
Little Grebe		1	
Mallard	9	49	15
Moorhen		1	
Mute Swan	9	12	
Oystercatcher	1		
Red-breasted Merganser	2	3	
Tufted Duck		66	
Total	22	161	15

Gulls and Terns

Table 5a. Incidental records of gulls and terns on Lough Corrib during visit 1 (complete survey).

Species	AOT	Individual	Pair
Arctic Tern		120	6
Black Headed Gull	290	15	
Common Gull	242	12	51
Common Tern	1		2
Great Black-backed Gull	1	5	0
Herring Gull		10	
Lesser-black-backed Gull		81	3
Total	534	243	62

Table 5b. Incidental records of gulls and terns on Lough Corrib during visit 2 (survey of upper lough only)

Species	AOT	Individual	Pair
Arctic Tern		1	5
Common Gull	67		
Great Black-backed Gull		2	
Lesser-black- backed Gull		1	
Total	67	4	5

Table 6. Incidental records of gulls and terns on Lough Ree.

Species	AOT	Individual	Pair
Black Headed Gull			350 min
Common Gull		1	
Common Tern		80 min	
Great Black-backed Gull		1	
Lesser-black backed Gull	250		
Total	250	82	350

Table 7. Incidental records of gulls and terns on Lough Conn and Cullin.

Species	Individual	Pair
Black Headed Gull	40	1
Common Gull	141	58
Common Tern	16	
Great Black-backed Gull	1	
Lesser-black backed Gull	25	9
Grand Total	223	68

Table 8. Incidental records of gulls and terns on Lough Arrow.

Species	Individual	Pair
Black Headed Gull	13	
Common Gull	15	11
Lesser-black backed Gull	2	
Grand Total	30	11

Appendix G. Distribution maps of ancillary data recorded at priority sites.

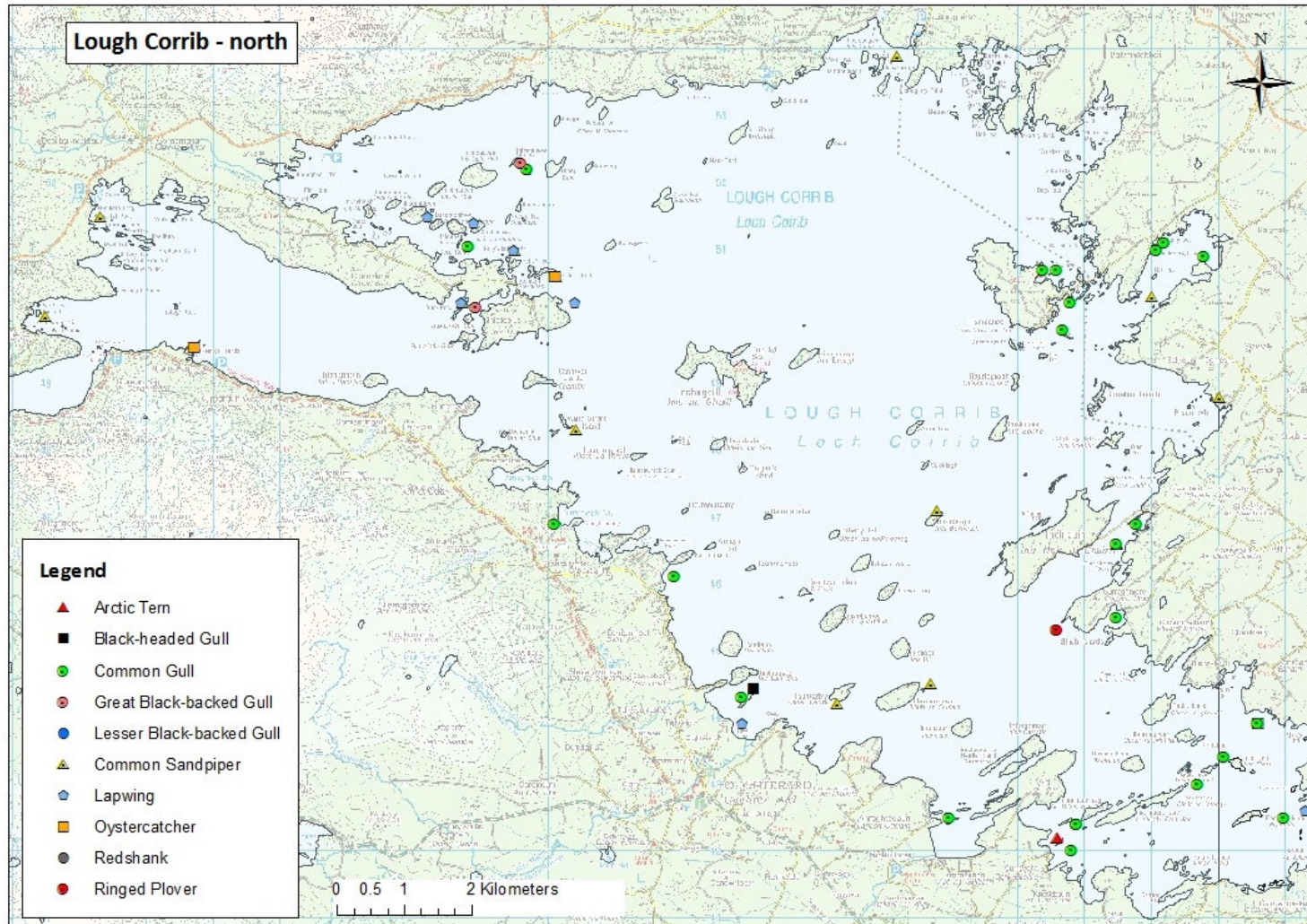


Figure 1. Distribution of other waterbird species recorded on upper Lough Corrib

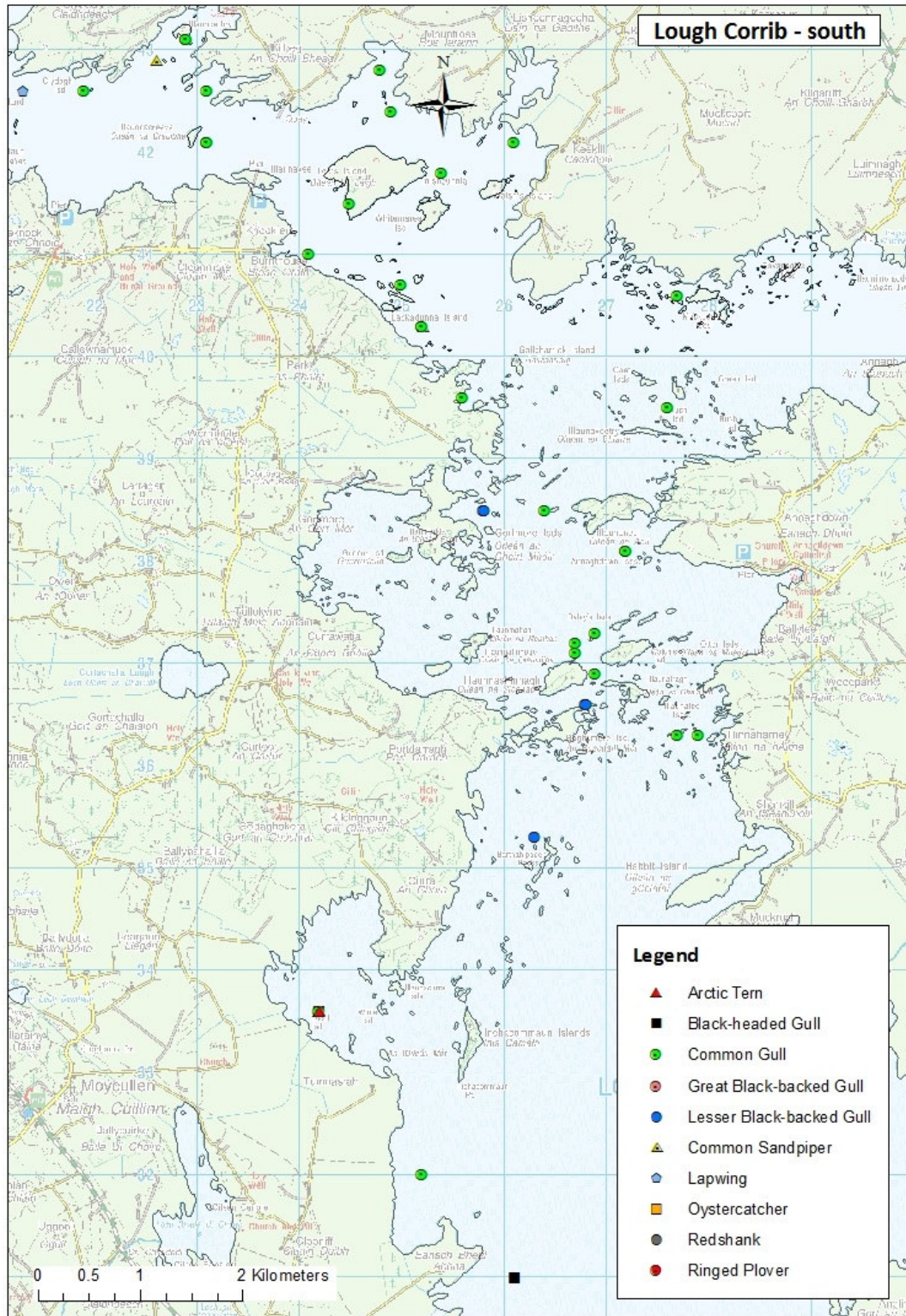


Figure 2. Distribution of other waterbird species recorded on mid and lower Lough Corrib

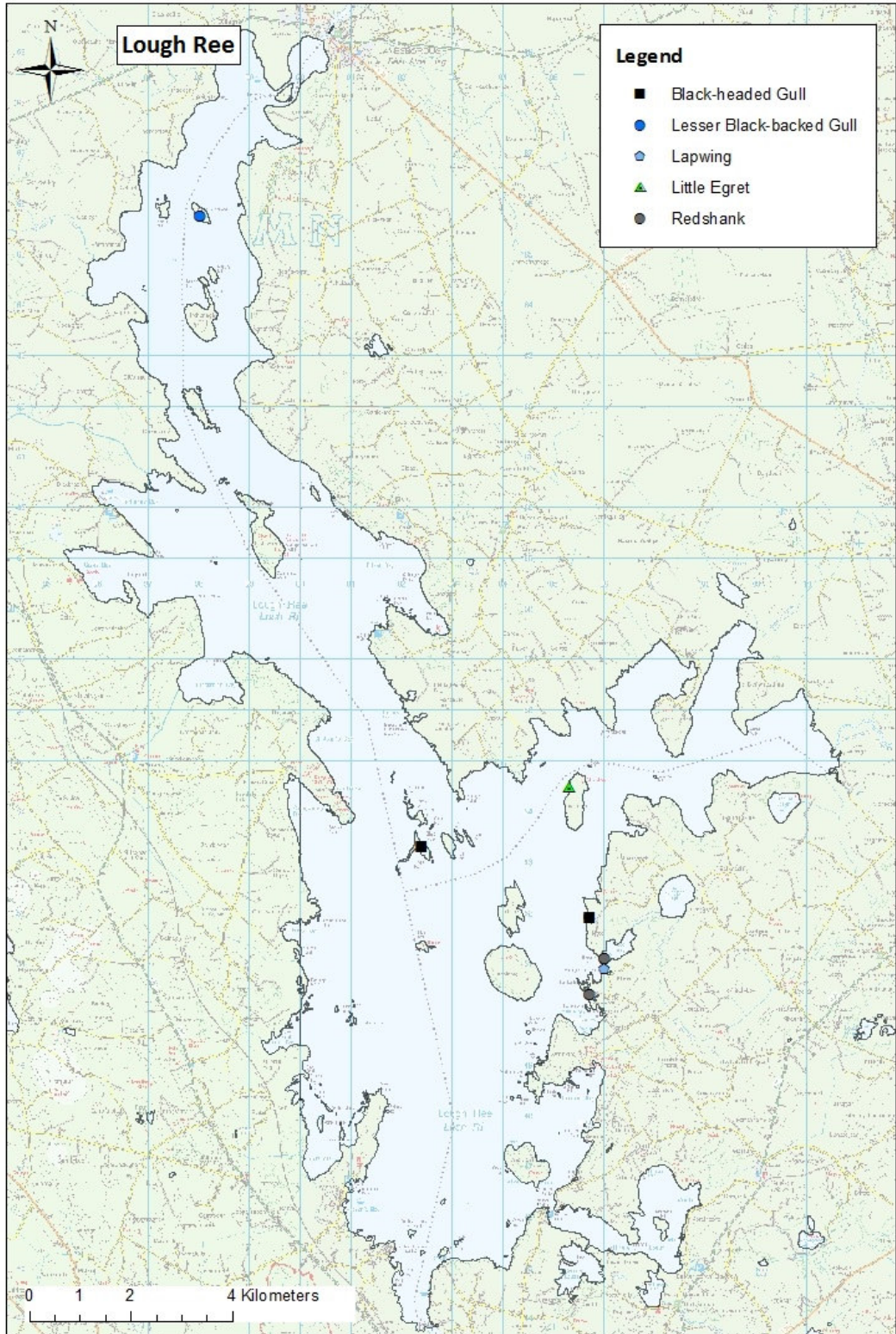


Figure 3. Distribution of other waterbird species recorded on Lough Ree



Figure 4. Distribution of other waterbird species recorded on Lough Ree

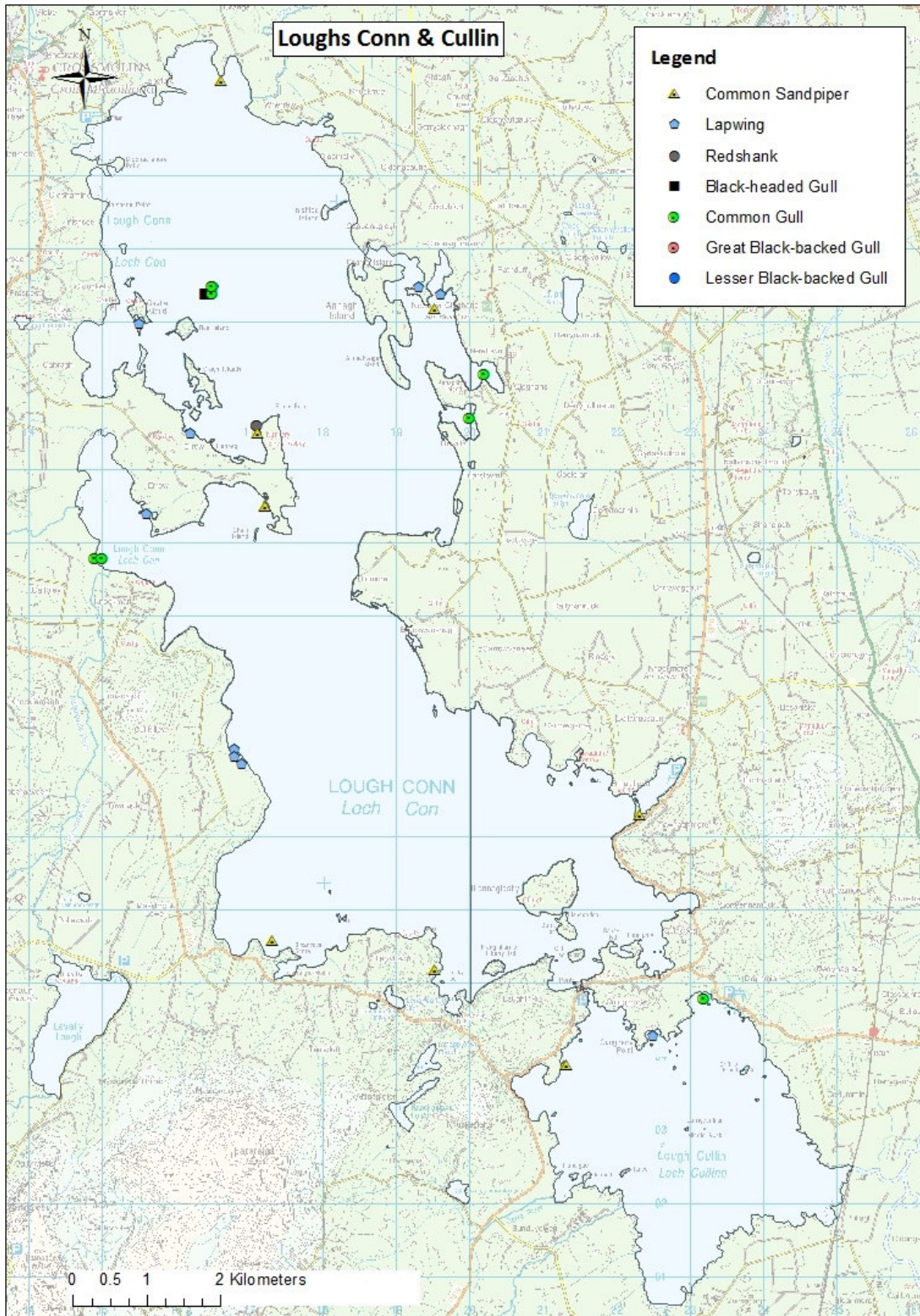


Figure 5. Distribution of other waterbird species recorded on Loughs Conn and Cullin

Appendix H. Environmental and survey data for non-priority sites.

Table 1. Survey and environmental data for non-priority sites

Site	Date	Start	End	Wind	Direction	Cloud	Rain	Visibility	Water Surface	Survey Type
Lough Drumaharlow	11.05.12	09:15	13:50	Light	E	34-66%,	None	Good	Calm	Boat
Lough Gill	17.05.12	09:20:	13:10	Calm		67-100%	Drizzle	Moderate	Calm	Boat
Lough Gara	24.05.12	14:30	18:30	Calm	Variable	0-33%;	None	Good	Calm	Shore
Lough Key	24.05.12	09:00	13:30	Calm	Variable	0-33%;	None	Good	Calm	Boat
Lough Carra	08.05.12	10:00	16:00:00	Breezy	NW	34-66%,	None	Good	Slightly choppy	Boat
Lough Mask	12.05.12	10:00	15:00	Breezy	NW	34-66%,	Showers	Good	Slightly choppy	Shore
Lough Mask	16.05.12	10:30	16:30	Breezy	NW	67-100%	None	Good	Slightly choppy	Boat
Lough Melvin	11.05.12	10:30	17:00	Breezy	NW	34-66%,	Showers	Good	Slightly choppy	Boat

Appendix I. Ancillary data for non-priority Sites.

Waterbirds (other than Common Scoter)

Table 1. Other waterbirds recorded on Lough Mask

Species	Definite pair	Individual
Cormorant		39
Common Sandpiper		10
Curlew		2
Mallard		83
Moorhen		1
Mute Swan	1	23
Oystercatcher		3
Red-breasted Merganser		14
Tufted Duck		26
Whimbrel		2

Table 2. Other waterbirds recorded on Lough Carra

Species	Individual
Cormorant	5
Coot	1
Grey Heron	3
Mallard	1
Mute Swan	6
Red-breasted Merganser	15
Tufted Duck	40
Whimbrel	1

Table 3. Other waterbirds recorded on Lough Drumaharlow

Species	Definite pair	Probable pair
Common Sandpiper		2
Great Crested Grebe	4	
Mute Swan	3	
Redshank		1

Table 4. Other waterbirds recorded on Lough Gara

Species	Definite Pair	Probable Pair	Single Male	Individual
Great Crested Grebe	4			5
Mallard		3	19	
Mute Swan		3		81
Tufted Duck		2	2	

Table 5. Other waterbirds recorded on Lough Gill

Species	Probable Pair	Individual
Common Sandpiper	5	
Mallard		100
Mute Swan		
Whooper Swan		1

Table 6. Other waterbirds recorded on Lough Key

Species	Definite Pair	Probable Pair	Single Female	Single Male	Individual	Young
Cormorant					5	
Coot	1				7	4
Common Sandpiper		1			1	
Great Crested Grebe	1				1	
Grey Heron					1	
Little Grebe					1	
Mallard	10	4		46		
Mute Swan	5				63	24
Red-breasted Merganser		2	1			
Tufted Duck		1		4		

Table 7. Other waterbirds recorded on Lough Melvin

Species	Definite Pair	Individual
Cormorant		12
Common Sandpiper	1	
Great Crested Grebe	1	
Mallard	2	4
Mute Swan	3	3
Red-breasted Merganser	1	1
Tufted Duck	2	7

Gulls and Terns

Note: AOT refers to Apparently Occupied Territory

Table 8. Gulls and terns recorded on Lough Carra

Species	Individual
Common Gull	1
Common Tern	39

Table 9. Gulls and terns recorded on Lough Drumaharlow

Species	Individual
Black Headed Gull	10
Common Tern	4
Lesser-black backed Gull	2

Table 10. Gulls and terns recorded on Lough Gill

Species	AOT
Black Headed Gull	18
Common Gull	5
Common Tern	16

Table 11. Gulls and terns recorded on Lough Key

Species	AOT
Arctic/Common Tern	5
Black Headed Gull	25

Table 12. Gulls and terns recorded on Lough Melvin

Species	Individual	Pair
Common Gull		1
Great Black-backed Gull	1	
Lesser-black backed Gull	2	

More detailed ancillary bird data including Grid References are stored as excel files.

Predators and human activity.

Table 13. Predators recorded at non-priority sites.

Site	Predators	Notes
Lough Drumaharlow	Buzzard	Above trees, on hillside overlooking lake
Lough Gill	Peregrine	Eyrie on south side of Lake. One bird present.
	Raven	Two on north side of lake.
	Hooded Crow	Present around lake/large islands
Lough Key	Hooded Crow	Bullock island and Long Island
Lough Mask	Hooded Crow	In several shore and island locations
Lough Melvin	Jay, Peregrine, Kestrel	Canada Goose also noted.
Lough Carra	Hooded Crow, Magpie, Fox	Fox observed carrying gull chick.
Lough Mask	Hooded Crow	Several locations on shore and islands
Lough Gara		None observed

Table 14. Human Activity recorded at non-priority sites

Site	Human Activity	Impact	Notes
Lough Drumaharlow	Angling	high	Pleasure boats/Angling. Major disturbance in all areas. Many pleasure/fishing boats.
Lough Gill	Angling	medium	Moderate on west side of lake, impact negligible rest of lake.
Lough Key	Angling	low	Part of Shannon waterway cruise liners and lake boats were abundant.
	Cruise boats	low	Minimum impact
Lough Mask	Angling	low	Anglers boats active in several locations. Little impact except in a few isolated areas.
Lough Carra	Angling	low	Anglers boats
Lough Gara	Angling	low	Minimum impact
	Other	low	Kids paddling.
Lough Melvin	Angling	low	Fishing/pleasure boats, minimum impact.