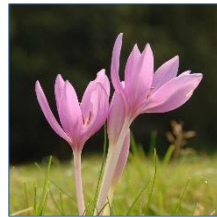


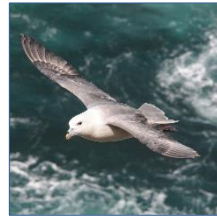
NATIONAL PARKS AND WILDLIFE SERVICE



THE STATUS OF BREEDING
COMMON SCOTER IN IRELAND,
2020



Marie Louise Heffernan &
Jackie Hunt



An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

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Limestone pavement, Bricklieve Mountains, Co. Sligo, Andy Bleasdale; **Meadow Saffron** *Colchicum autumnale*, Lorcan Scott; **Garden Tiger** *Arctia caja*, Brian Nelson; **Fulmar** *Fulmarus glacialis*, David Tierney; **Common Newt** *Lissotriton vulgaris*, Brian Nelson; **Scots Pine** *Pinus sylvestris*, Jenni Roche; **Raised bog pool**, Derrinea Bog, Co. Roscommon, Fernando Fernandez Valverde; **Coastal heath**, Howth Head, Co. Dublin, Maurice Eakin; **A deep water fly trap anemone** *Phelliactis* sp., Yvonne Leahy; **Violet Crystalwort** *Riccia huebeneriana*, Robert Thompson

Main photograph:

Common Scoter (female) *Melanitta nigra*, Doorus, Lough Corrib, Co. Galway, Marie Louise Heffernan



The Status of Breeding Common Scoter in Ireland, 2020

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Contents

Executive Summary	i
Acknowledgements	i
1. Introduction	3
1.1 History of Common Scoter in Ireland	4
1.2 Previous Surveys	5
2. Methods.....	6
2.1 Survey Sites	6
2.2 Coverage of survey sites and timing of visits.....	7
2.2.1 Pre-breeding census.....	7
2.2.2 Brood survey.....	8
2.3 Survey Methods.....	8
2.3.1 Common Scoter breeding population survey techniques	8
2.3.2 Estimating the breeding population.....	9
2.3.3 Common Scoter brood surveys.....	9
2.3.4 Estimating factors in breeding success	9
2.3.5 Habitat	10
2.3.6 Potential factors of disturbance.....	10
2.3.7 Ancillary waterbird data.....	10
3. Results	11
3.1 The Irish Common Scoter population	11
3.1.1 Population estimate	11
3.1.2 Brood Surveys	13
3.2 Site Accounts.....	14
3.2.1 Lough Corrib	14
3.2.2 Lough Ree	22
3.2.3 Lough Arrow	25
3.2.4 Loughs Conn and Cullin.....	26
3.2.5 Loughs Gara	28
3.3 Other Observations	28
4. Discussion.....	29

4.1	The All – Ireland Breeding Population	29
4.2	Breeding Success and Productivity	30
4.2.1	Breeding success	30
4.2.2	Productivity	31
4.3	Site Accounts	31
4.3.1	Lough Corrib	31
4.3.2	Lough Ree	35
4.3.3	Loughs Conn and Cullin	36
4.3.4	Lough Arrow	37
4.4	Assessment Of Survey Accuracy	37
4.4.1	Timing of survey	37
4.4.2	Coverage	38
4.4.3	Survey constraints	39
4.4.4	Effect of scoter movements on survey accuracy	39
4.4.5	Plumage, bill morphology and identification notes	39
4.5	Factors Influencing Common Scoter populations in Ireland	41
4.5.1	Lake ecology	41
4.5.2	Predation	44
5.4.3	Disturbance	45
4.5.3	Other factors	46
5.	Conclusions & Recommendations	47
6.	Bibliography & Relevant Literature	49
Appendix 1	Survey dates and coverage	52
Appendix 2	Survey instructions for the pre-breeding survey.	53
Appendix 3	Brood survey instructions.	62

Executive Summary

The Common Scoter (*Melanitta nigra*) is a small black sea duck that is present in thousands around the coast of Ireland in winter, with a small population breeding on Ireland's inland lakes. In 2020, a survey was undertaken to provide an updated estimate of the Common Scoter breeding population and to assess their productivity.

Pre-breeding surveys revealed a potential breeding population of 50 pairs on four lakes. Lough Corrib held the greatest number of Common Scoter with 38 pairs. Seven pairs were recorded at Lough Ree, four pairs at Lough Arrow and one pair at Loughs Conn and Cullin. Lough Gara was also surveyed but no Common Scoter were found.

Although the Common Scoter breeding population in 2020 was 38% below the 1999 population of 80 pairs, it has increased by 28% since 2012, when the population stood at 39 pairs. At three of the sites - Lough Ree, Lough Arrow, and Loughs Conn and Cullin - the breeding population has remained low but stable since 2012. The recent increase in the national population is due to a 36% increase at Lough Corrib from 28 pairs in 2012 to 38 pairs in 2020.

Brood surveys were completed on all lakes which held Common Scoter in the pre-breeding surveys. Successful breeding was recorded on only two lakes, with a total of thirteen broods recorded: eight broods on Lough Corrib and five on Lough Ree. On Lough Ree, seven pairs produced five broods (71% breeding success) whereas on Lough Corrib 38 pairs produced only eight broods (21% breeding success). No broods were found on Lough Arrow or on Loughs Conn and Cullin. Productivity - the number of ducklings produced per breeding pair - was 1.1 on Lough Ree and 0.55 on Lough Corrib.

To conserve the Irish breeding Common Scoter population a greater understanding of the population's ecological requirements and associated pressures and threats is required. Factors contributing to population trends are not well understood, with populations at some sites showing stable or increasing trends while others have shown significant declines or extirpations. These factors have contributed to the population's apparent dependence on Loughs Corrib and Ree. Empirical evidence from breeding sites is required in order to design, target and implement robust conservation measures that will allow the species to maintain or recover its populations and range. This report includes a number of recommendations based on the findings of this survey.

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The pre-breeding and brood surveys were carried out in part by National Parks and Wildlife Service (NPWS) staff and by surveyors under contract. Lough Arrow was surveyed by Tim Roderick and Rob Wheeldon (NPWS). Inland Fisheries Ireland staff Jimmy Frazer and Ciaran Jennings are thanked for their assistance at Lough Arrow. Lough Conn and Cullin was surveyed by Irene O' Brien and Hazel Doyle with assistance from Eoin McGreal and Leonard Floyd (all NPWS); boat services were provided by Ciaran Connelly and Padraig Farrell. Lough Ree was surveyed by Chris Benson with boat services provided by Paul Foxe. Lough Gara was surveyed by Chris and Lynda Huxley (boat operator and surveyor team). Lough Corrib was surveyed by the authors with special thanks to the second observers and boat operators Larry McCarthy and Dennis Moss and to Eugene Finnerty (NPWS) and Evelyn Joyce (NPWS) for their additional shore surveys.

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1. Introduction

Common Scoter *Melanitta nigra* breed throughout the low arctic in Scandinavia and West Siberia (Perrins & Cramp, 1997, Wetlands International, 2020), 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 declined from 95 pairs in 1995 to 52 pairs in 2007 (Hancock, 2012; Musgrove *et al.*, 2013). In Ireland breeding numbers declined from 100 pairs in 1995 to 39 pairs in 2012 (Hunt *et al.*, 2012).

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). Data on wintering population trends is poor (Wetlands International, 2020). The short term trend is assessed as increasing while the long term trend is assessed as unknown/fluctuating. Boland & Crowe (2012) speculated that flock sizes of Common Scoter wintering in Ireland were declining, with a wintering population estimate at 7,480 individuals. The most recent population estimate of wintering Common Scoter in Ireland (2009/10 – 2015/16) is 10,640 individuals (Lewis *et al.*, 2019). Trend information is not provided by Lewis *et al.* (2019) owing to problems with detecting and accurately counting a species which has a largely offshore distribution. This gap may be addressed in the future with offshore surveys such as the Observe programme (Jessop *et al.*, 2018).

The breeding population of Common Scoter is included on the Red list of Birds of Conservation Concern in Ireland (Colhoun & Cummins, 2013) and is thus of high priority for conservation actions. Ireland has a small breeding population over a small geographical range. Common Scoter have been evaluated under the EU and Global Red list criteria as a species of Least Concern (Birdlife International, 2020) owing to its large population size, structure, range and habitat availability.

The objectives of the 2020 survey were:

1. To obtain an estimate of the current Irish Common Scoter breeding population based on four lakes where Common Scoter are known to breed: Lough Corrib, Lough Ree, Lough Arrow, Lough Conn and Cullin and to assess breeding at a further possible site: Lough Gara.
2. To compare this estimate to that of previous surveys.
3. To complete brood surveys at all Common Scoter breeding sites.
4. To estimate breeding success and productivity at Common Scoter breeding sites in 2020 and compare to previous surveys.

1.1 History of Common Scoter in Ireland

Common Scoter was first recorded breeding on the island of 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 pairs (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). Note: where a range is given for the breeding population, the minimum is observed definite and probable pairs and the maximum is the number of potentially breeding females.

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).

In 2012, a 50% decline in the Irish breeding Common Scoter population since 1999 was reported (Hunt *et al.*, 2012). The 2012 national Common Scoter Survey estimated a potential breeding population of just 39 pairs (compared to 80 pairs in 1999). Lough Corrib held the greatest number of Common Scoter with 28 pairs (72% of the national breeding population). Five pairs each were recorded at Loughs Ree and Arrow and one pair was recorded at Loughs Conn and Cullin. The 2012 survey recorded stable breeding numbers at Lough Corrib, however the dramatic decline in numbers recorded in 1999 at Loughs Conn and Cullin was confirmed (two pairs in 1999 down to five pairs in 2012) and a further dramatic decline in numbers was reported at Lough Ree (32 pairs in 1999 down to five pairs in 2012). Breeding numbers at the most recently occupied site Lough Arrow remained stable (five pairs in 1999 and four pairs in 2012). Seven other potential sites were also surveyed in 2012 and were found to support no scoter (Hunt *et al.*, 2012).

In Scotland there is a small breeding population restricted to the Flow Country of Caithness and Sutherland and to larger loughs in Inverness-shire and Perthshire (Hancock *et al.*, 2019). Surveys in Scotland indicate a reduction in numbers from 95 pairs in 1995 to 52 pairs in 2007 accompanied by a 25% reduction in the number of occupied loughs and a 17% reduction in occupied 10km squares. By 2010 the numbers in Scotland had fallen to 42 pairs (Balmer *et al.*, 2013). The Irish and Scottish populations of Common Scoter are the edge of their breeding range. Over the last 25 years both populations have shown a similar pattern of decline.

1.2 Previous surveys

Previous surveys of breeding Common Scoter 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 the island of Ireland. The first systematic survey, of known and potential breeding sites using standard survey methods, was completed in 1995 (Gittings, 1995). This survey of the core breeding sites was repeated in 1996 following the oil spill from the MV *Sea Empress* (Delaney & Gittings, 1996). The 1995 and 1996 survey was repeated in 1999 (Tierney, 2001). In 2004 a survey of Loughs Conn and Cullin was completed (Heffernan & Hunt, 2004). In 2012 four priority sites (those with breeding Common Scoter in the 1995, 1996 and 1999 surveys) and seven non priority sites (those identified as historical, possible or potential breeding sites) were surveyed (Hunt *et al.*, 2012). Since then, incidental records of breeding Common Scoter have been collated by National Parks and Wildlife Service (NPWS) staff.

Data on Common Scoter productivity and breeding success is available for Lough Corrib (Tierney, 2001; Partridge & Smith, 1988; Hunt *et al.*, 2012) and for Lower Lough Erne, Loughs Conn and Cullin and Lough Ree (Partridge & Smith, 1988).

The term “hatching success” has been used in Irish Scoter surveys since Partridge & Smith (1988) to describe the number of broods per potential breeding pair (calculated by dividing the total number of broods recorded by the total number of potential breeding pairs). This term is likely to cause some confusion as it does not relate to the number of nests or eggs. This metric of “broods per potential pair” is to be retained but will be referred to herein as “breeding success”. Retaining the same metric will facilitate comparison with previous surveys.

2. Methods

The survey methods, which are outlined below, broadly follow those described by Gittings (1995) and are the same as those used in 2012 (Hunt *et al.*, 2012). All survey work was completed in 2020.

2.1 Survey sites

Sites for the pre-breeding survey (Table 1; Figure 1), were selected by NPWS based on previous surveys (Gittings, 1995; Delaney & Gittings, 1996; Tierney *et al.*, 2000, Tierney, 2001; Hunt *et al.*, 2012). The sites selected were specifically those with records of breeding Common Scoter in 2012: Lough Corrib, Lough Ree, Lough Arrow, Loughs Conn and Cullin (Table 1). Owing to a recent record of Common Scoter at Lough Gara, this site was also surveyed. Previous surveys had reported that other potential breeding sites were not occupied and thus these were not surveyed. Brood surveys were completed at all sites where Common Scoter were recorded in the 2020 pre-breeding survey: Lough Corrib, Lough Ree, Lough Arrow and Loughs Conn and Cullin.

All known Common Scoter breeding sites are at least 1,000 ha and are located in mid–west Ireland (Figure 1). The trophic status of all lakes is mesotrophic to oligotrophic and water quality status is good for two lakes and moderate for the remainder. The predominant geology of all lakes is limestone (GSI, 2020).

Table 1 Size, Trophic Status and water quality status of survey lakes. Trophic status from (McGarrigle *et al.*, 2009), water quality status from EPA (2020).

Survey site	Surface area (ha)	Trophic status	Water quality status (2013-2018)
Lough Corrib (upper)	16,562	Mesotrophic	Good
Lough Ree	10,000	Oligotrophic	Good
Lough Conn/Cullin	5,720	Oligotrophic	Moderate
Lough Arrow	1,240	Mesotrophic	Moderate
Lough Gara	1,200	Oligotrophic	Moderate

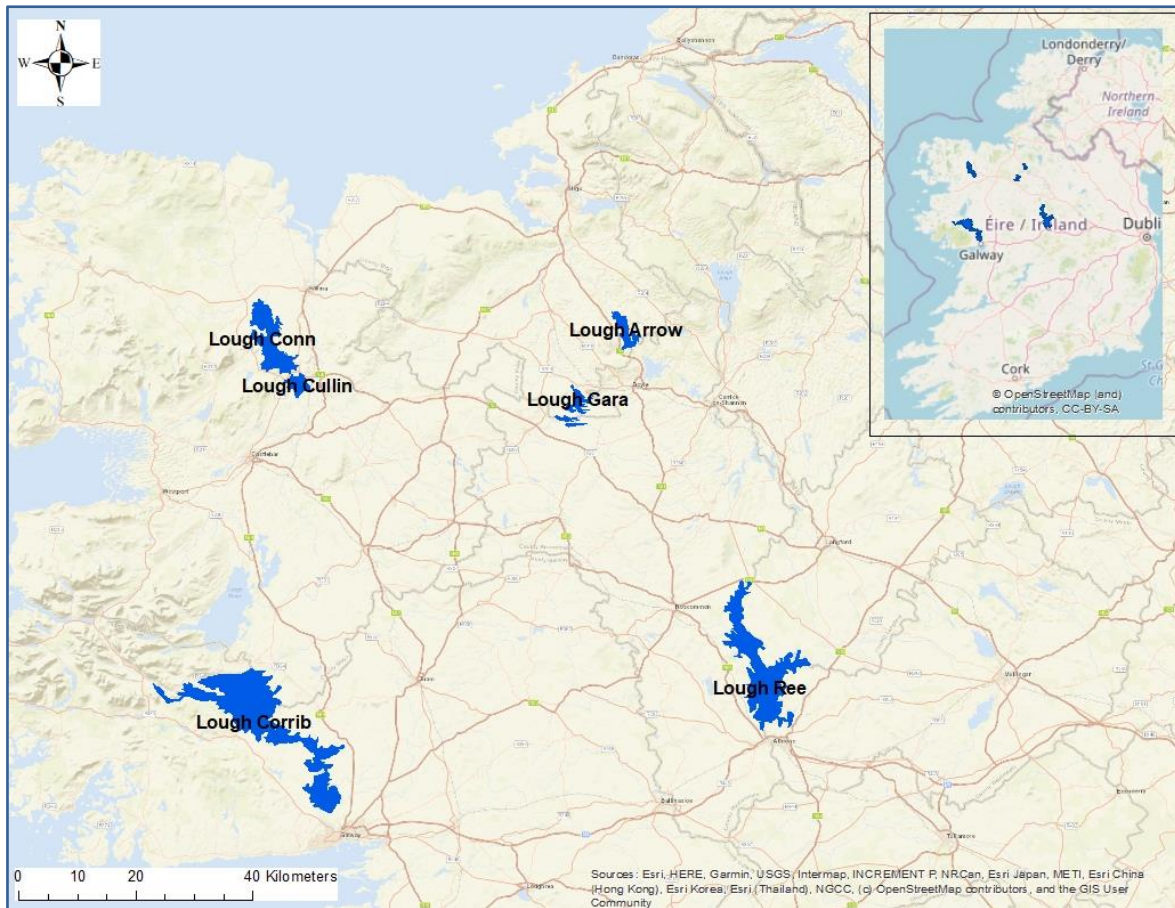


Figure 1 Location of lakes surveyed for breeding Common Scoter in 2020 (shown in dark blue).

2.2 Coverage of survey sites and timing of visits

2.2.1 Pre-breeding census

All sites were surveyed by boat twice during the optimal period of 7th–21st May as recommended by Tierney (2001) (see Table A1, Appendix 1). Except for Lough Corrib, all 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 six survey days. A survey day is two observers in one boat for one full day. Two observers were on Lough Corrib (separate boats) for two of these days, thus full coverage was achieved in four days. As in previous pre-breeding surveys of Lough Corrib, Common Scoter were 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 on Lough Corrib, as per previous surveys, the 2020 survey targeted the upper lough only and excluded the deep water arm west of Doon. The second visit was completed in five survey days over three days, with two surveyors in separate boats on two of these days.

Lough Ree was surveyed over three days during both visit one and visit two. Loughs Conn and Cullin were surveyed over two days per visit and Lough Arrow (whole site) was covered over a single day per visit. The main part of Lough Gara was surveyed by boat on visit 1 and visit 2. A land-based survey was carried out on the southernmost arm of Lough Gara which was inaccessible by boat owing to very low water levels. The middle area of the lough was also inaccessible by boat and could not be surveyed by land owing to access issues. Neither of these areas were considered to be suitable habitat for

breeding Common Scoters. Both arms are marl or mud-bottomed with extensive emergent vegetation. Common Scoter normally favour rocky substrate and seem to avoid reed-beds in the pre-breeding phase. These areas also lacked suitable island or shoreline nesting habitat.

Surveys were not undertaken where winds were greater than Beaufort Force 4, during heavy rain, or where the water was very choppy. Conditions were generally ideal for all surveys in 2020.

2.2.2 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 present during the pre-breeding survey. All sites were surveyed at least three times and at least once within each of the three optimal survey periods between the 1st of July and 17th August; see Table A2, Appendix) following Partridge and Smith (1988). Tierney (2001) identified the last two weeks in July and the first week of August as optimal to estimate breeding success and productivity. Hancock (Mark Hancock, Royal Society for the Protection of Birds (RSPB), pers. comm.) has observed peak of hatching to be the second week of July at Scottish Common Scoter breeding sites. All surveys were carried out during the optimal survey window. The gap between surveys was at least seven days.

On Lough Corrib four visits were completed within the optimal survey period, with a fifth visit at the end of August, outside of this period (Table A2). These additional surveys were required on Lough Corrib owing to differences in hatching dates between different parts of the lake and in order to track later hatching broods. To reduce the potential for double counting core breeding areas were surveyed on the same day with two boats. The fifth visit on Lough Corrib covered the Oughterard-Ard area only where later hatching broods were considered likely to still be present. The broods at the northern end of the lake (Doorus) were recorded on the first visit and were no longer present by the fourth visit. A fifth visit was not considered necessary.

The brood survey prioritised all areas where Common Scoter were recorded during the 2020 pre-breeding survey and where time allowed coverage was expanded to include areas where scoter were recorded in the 2012 survey. Additional coverage sought to detect broods which may have moved from the areas where nesting was considered most likely. The distribution maps from the 2012 common scoter survey were used for reference.

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. As for the pre-breeding survey, survey conditions were often ideal.

2.3 Survey methods

Field methods for recording Common Scoter were based on Gittings (1995) and are detailed in Appendix 2. Ancillary data on habitat types followed the categories identified by Gittings (1995) and by Tierney (2001) and were those used in 2012 (Hunt *et al.*, 2012). Data on predators, human activity and other pressures, and other waterbirds present was also collected during the survey. Hand-held GPS devices, phone tracking and navigation apps and paper maps were used to record the location of all observations.

2.3.1 Common Scoter breeding population survey techniques

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

two observers; one of whom was also the boat operator. The boat operator planned the optimal route to achieve complete coverage of all islands and shallow bays. The boat operator and primary observer determined speed of boat for optimal scoter detection, taking into account weather, light and lake topography.

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). 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.

2.3.2 Estimating the breeding population.

Following Gittings (1995), Underhill *et al.* (1998) and Tierney (2001), an estimate of the breeding Common Scoter population can be expressed as the number of adult 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).

2.3.3 Common Scoter brood surveys

The methodology followed that of the pre-breeding survey (see Section 3.2.1) and is detailed in Appendix 3. 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). Where age class was uncertain the youngest age class was used.

2.3.4 Estimating factors in breeding success

Breeding success is defined as the maximum number of females that successfully produced a brood. Hatching success cannot be estimated as surveys of nests and number of eggs per nest are not completed. Productivity was calculated as number of ducklings of age class II produced per potential breeding female. It is assumed that these birds successfully fledge and are recruited into the breeding population. This is a limitation of the survey data as these birds are assumed to fledge but may not necessarily do so. This approach may lead to an over estimation of productivity however it has been observed on this and previous surveys that once scoter reach age class IIc/III they disperse and an accurate count is unlikely to be achieved.

Age class IIc was used by Tierney (2001) to estimate productivity. The maximum age class reported within class II has been used in this report and in 2012. In 2012 no ducklings were recorded on Lough Corrib by the 7th of August and no Class IIc ducklings or older were recorded in the brood survey. In 2020 ducklings were still on the lake on the 30th of August. The gap between brood surveys can be greater than two weeks with weather considerations and as ducklings become older they are likely to move or fledge making data interpretation more difficult. Productivity in Scotland is calculated as the number of ducklings of any size, seen on the final brood count (second week of August) divided by peak number of females. They do not always use the size classes but often work with % female length (Mark Hancock, RSPB, pers. comm).

2.3.5 Habitat

Islands and their habitats were recorded during the pre-breeding survey where an association with Common Scoter was noted. Evidence of grazing (sheep/cattle/goats) was also recorded. All data is supplied to NPWS in an excel file.

2.3.6 Potential factors of disturbance

The presence of any mammalian or avian predators (*e.g.* raptors, corvids) was recorded during surveys. Human activities observed on the lake or its islands with the potential to disturb Common Scoter were also recorded. Observations on these factors is supplied to NPWS as an excel file.

2.3.7 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 Sites or Nests (AOS/AON) were recorded where possible, otherwise the number of individuals was estimated. Single nesting gulls which were common on Lough Corrib, were also counted.

3. Results

3.1 The Irish Common Scoter population

3.1.1 Population estimate

The national breeding population was estimated at 50 potential breeding pairs (Table 2). Breeding pairs were recorded on Loughs Corrib, Lough Ree, Lough Arrow and Loughs Conn and Cullin (Table 2). No Common Scoter were detected at Lough Gara. The estimate of potential breeding pairs includes definite pairs, probable pairs and single adult females which are assumed to be part of the breeding population. The population estimate is expressed as the number of females present regardless of pairing status. This assumes that all females subsequently attempt to breed, based on the assumption that non-breeding birds remain in coastal waters (Underhill *et al.*, 1998).

The population estimate is determined by calculating the total number of birds present in each lake per visit, selecting the visit with the maximum number of birds present and summing these maxima, thus assuming that interchange of Common Scoters between lakes was negligible (Underhill *et al.*, 1998). Following this approach the maximum count for Lough Corrib was on visit 2, for Lough Ree visit 1, Lough Arrow visit 1 and Loughs Conn and Cullin visit 2 (see Table 2).

Lough Corrib held the greatest number of Common Scoter with a maximum of 38 potential pairs (30 definite pairs, one probable and seven unpaired females) in total in the second visit. The number of probable and definite pairs increased from 28 to 31 between visit 1 and visit 2 with the number of potential breeding females remaining similar. The remaining three sites had a much lower number of both definite and probable breeding pairs with no unpaired females at any site. The numbers of pairs between visit 1 and visit 2 decreased at Lough Ree (seven to two) and at Lough Arrow (four to two). Only one breeding pair was recorded at Loughs Conn and Cullin on the second visit.

Table 2 Breeding population estimates from each pre-breeding survey visits, 2020.

Survey site	Visit no.	Definite pairs	Probable pairs	Single female	Potential pairs
Lough Corrib	1	20	8	6	34
	2	30	1	7	38
Lough Ree	1	5	2	0	7
	2	1	1	0	2
Lough Arrow	1	2	2	0	4
	2	2	0	0	2
Lough Conn/Cullin	1	0	0	0	0
	2	1	0	0	1
Lough Gara	1	0	0	0	0
	2	0	0	0	0
Maximum	-	38	5	7	50

Lough Corrib was the only site with unpaired or single female Common Scoters during the pre-breeding survey (Table 3). Numbers of single females at Lough Corrib were relatively low, giving a high percentage of paired females both at site and total population level. Single adult male scoter were recorded at all sites with the largest number recorded at Lough Corrib on visit 2 (24). A maximum of 11 single males was recorded at Lough Ree and five at Lough Arrow. At least two males were present for each female at Lough Ree and Lough Arrow. Lough Corrib showed the lowest male to female ratio.

Table 3 Summary of adult Common Scoter recorded in 2020, with breakdown of pairs, sexes, percentage of females which were paired with a mate, and male to female ratio. Pairs includes definite and probable pairs (see Table 2).

Site	Visit	Pairs	Single male	Single female	Total male	Total female	Total individual	Paired females (%)	Male: female
Lough Corrib	1	28	21	6	49	34	83	82	1.4:1
	2	31	24	7	55	38	93	81	1.4:1
Lough Ree	1	7	11	0	18	7	25	100	2.6:1
	2	2	4	0	6	2	8	100	3:1
Lough Arrow	1	4	5	0	9	4	13	100	2.3:1
	2	2	3	0	5	2	7	100	2.5:1
Lough Conn/Cullin	1	0	0	0	0	0	0	-	-
	2	1	0	0	0	1	0	100	0:1
Lough Gara	1	0	0	0	0	0	0	-	-
	2	0	0	0	0	0	0	-	-
Maximum	-	43	40	7	82	50	131	86	1.6:1

3.1.2 Brood surveys

Brood surveys were carried out on all lakes that had Common Scoter in the pre-breeding surveys. No broods were found on Lough Arrow or Loughs Conn and Cullin. Only Lough Corrib and Lough Ree produced broods. In total 13 Common Scoter broods were recorded on these lakes. On Lough Corrib eight broods and a maximum of 42 ducklings were recorded, and on Lough Ree five broods a maximum of 24 ducklings were recorded (Table 4). While the greatest number of broods and ducklings was recorded at Lough Corrib, both productivity and breeding success were notably higher at Lough Ree. The timing of the brood surveys was sufficient to record ducklings reaching class IIa or IIb (c. 23-30 days) and there were sufficient surveys in August to record the oldest age classes of IIc and III.

Table 4 Brood survey results from 2020. The maximum number of ducklings is an amalgamation of data from all brood survey visits. Productivity is estimated as the number of class II or older ducklings per potential breeding pair (note: on Lough Ree 10 ducklings reached class IIa but two were lost before they reached class IIc and are therefore omitted).

Site	Potential pairs	No. of broods	Breeding success	Max. no. of ducklings	No. of ducklings reaching class II	Productivity
Lough Corrib	38	8	21%	42	21	0.55
Lough Ree	7	5	71%	24	8	1.1
Lough Conn/Cullin	1	0	0	0	0	0
Lough Arrow	4	0	0	0	0	0
Total	50	13	26%	66	29	0.58

3.2 Site accounts

3.2.1 Lough Corrib

Pre-breeding survey

The maximum number of potential pairs recorded on Lough Corrib is 38 (definite and probable pairs and single adult females). The maximum number of adult single females is seven and the maximum number of adult single males is 24. The male: female ratio was 1.4 males to 1 female on both visits (Table 5).

Table 5 The number of pairs and individual birds recorded on Lough Corrib in visit 1 and visit 2.

Visit	Definite pairs	Probable pairs	Single adult male	Single adult female	Potential pairs	Ratio Male: Female
Visit 1	20	8	21	6	34	1.4:1
Visit 2	30	1	24	7	38	1.4:1

Pre-breeding distribution

The Common Scoter population on Lough Corrib was concentrated in the upper lough (Table 6, Figures 2 - 6). Within the upper lough, Common Scoter were concentrated in Areas 2 (Doorus), 3 (Inchagoill) and 4 (Oughterard-Ard) on the western half of the lough. Oughterard-Ard had the highest number of scoter, followed by Doorus. Numbers in Inchagoill were comparatively low. One pair of scoter was recorded in the eastern half of the lough (Inishmacateer-Inchiquin).

The number of breeding pairs within each area increased between visit 1 and visit 2 with the exception of Area 5 where one pair only was recorded in visit 1. The increase in pairs was most marked in Area 4 (Oughterard -Ard) (Table 6).

Table 6 Changes in distribution of Common Scoter on Lough Corrib between visit 1 and visit 2.

Area	Visit	Definite pairs	Probable pairs	Single adult male	Single adult female
Doorus Cornamona (Areas 1 & 2)	1	3	4	5	1
	2	5	1	3	0
Inchagoill (Area 3)	1	3	0	2	0
	2	2	0	3	0
Oughterard-Ard (Area 4)	1	13	4	14	5
	2	23	0	18	7
Inishmacateer-Inchiquin (Area 5)	1	1	0	0	0
	2	0	0	0	0

Other observations

During the pre-breeding survey nineteen observations were made of Common Scoter associating with islands. The observations were as follows 42% of pairs associated with wooded grazed islands (grazed island with a woodland edge), 33% were fully wooded islands, 19% were scrub covered and 4% were fully grazed islands without woodland.

Four potential predators were recorded during surveys: Hooded Crow (*Corvus cornix*), Raven (*Corvus Corax*), Stoat (*Mustela erminea Hibernica*) and Otter (*Lutra lutra*). While Mink (*Mustela vison*) were not recorded from surveys they are known to be present at this site. Of all the predators recorded, Hooded Crow was observed most often (62 observations during pre-breeding surveys). There were six observations of Raven, two of Otter and one of Stoat.

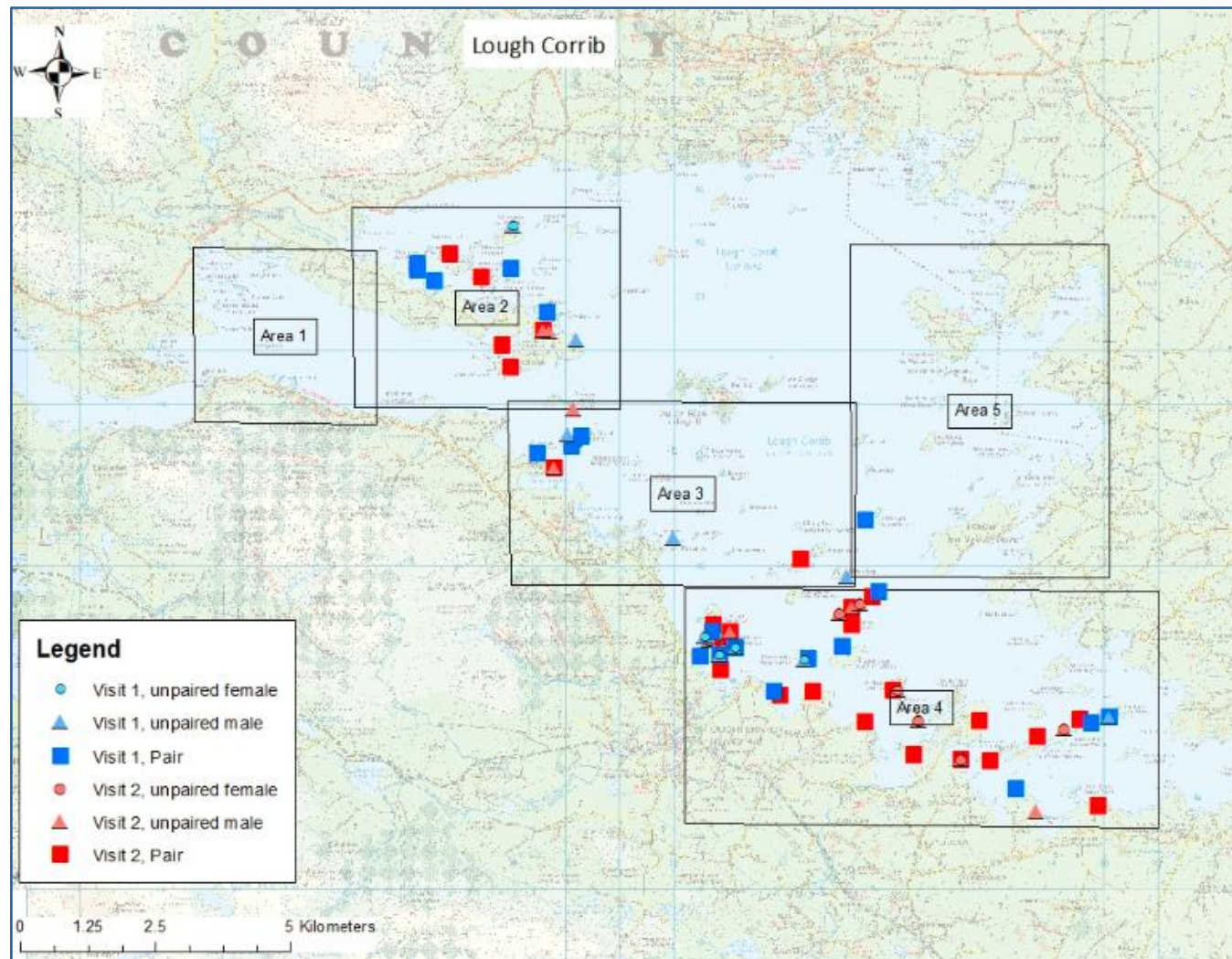


Figure 2 Overview of distribution of Common Scoter recorded during the 2020 pre-breeding survey. Common Scoter were recorded in Areas 1-5 during the 2012 survey. These areas are displayed for consistency and comparison.

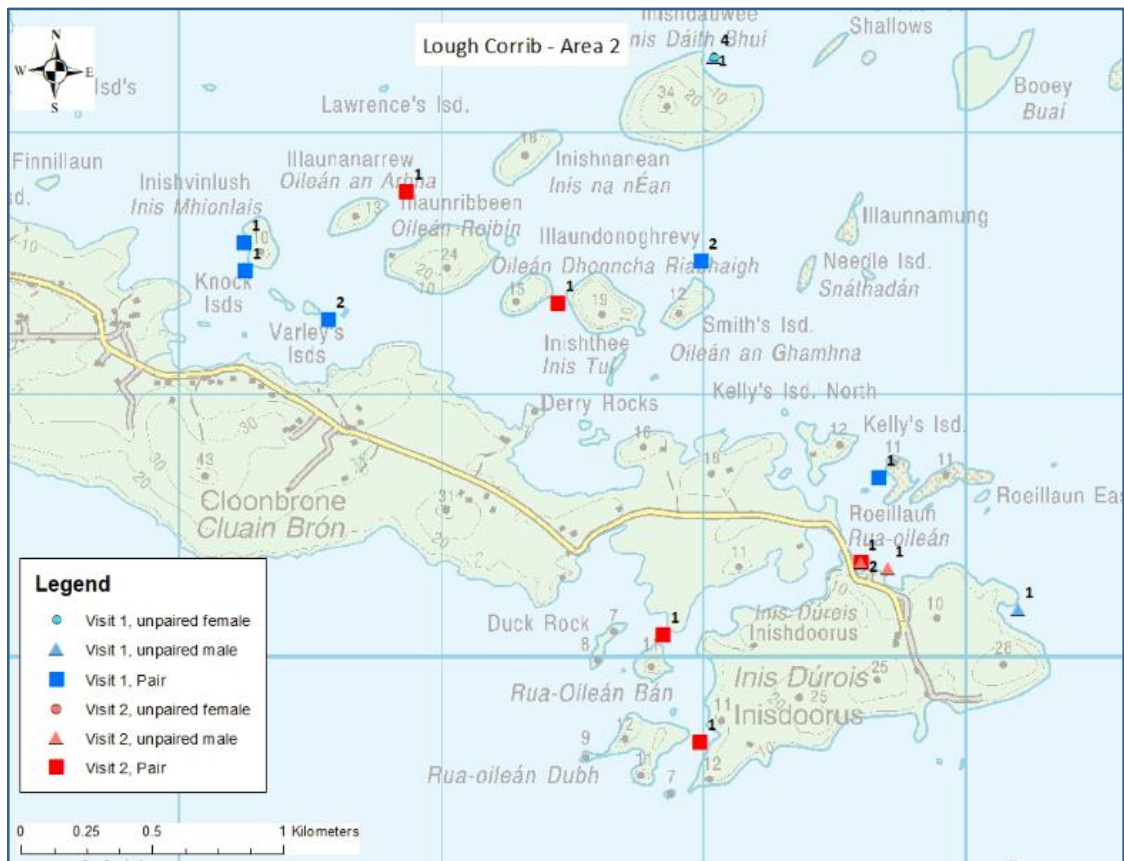


Figure 3 Common Scoter distribution in Area 2 on Lough Corrib, 2020. Numbers associated with each symbol denote the number of pairs or individuals recorded.

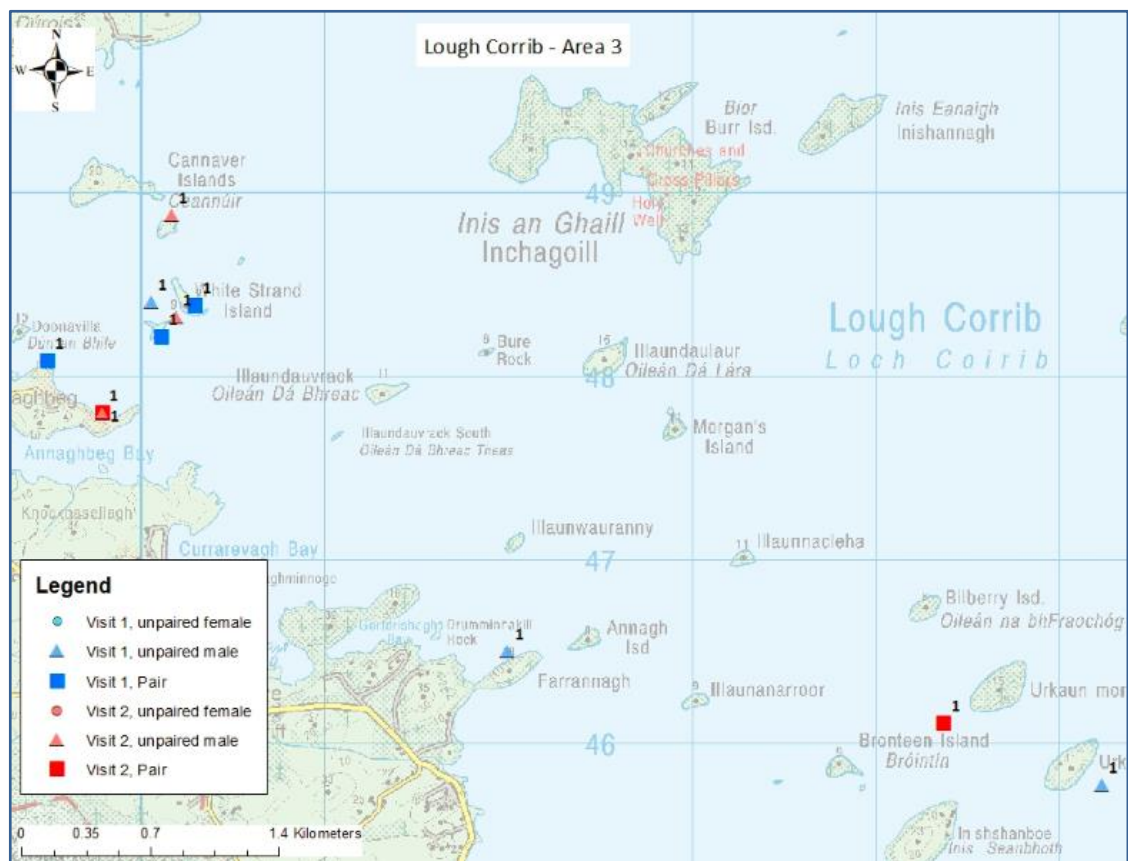


Figure 4 Common Scoter distribution in Area 3 on Lough Corrib, 2020. Numbers associated with each symbol denote the number of pairs or individuals recorded.

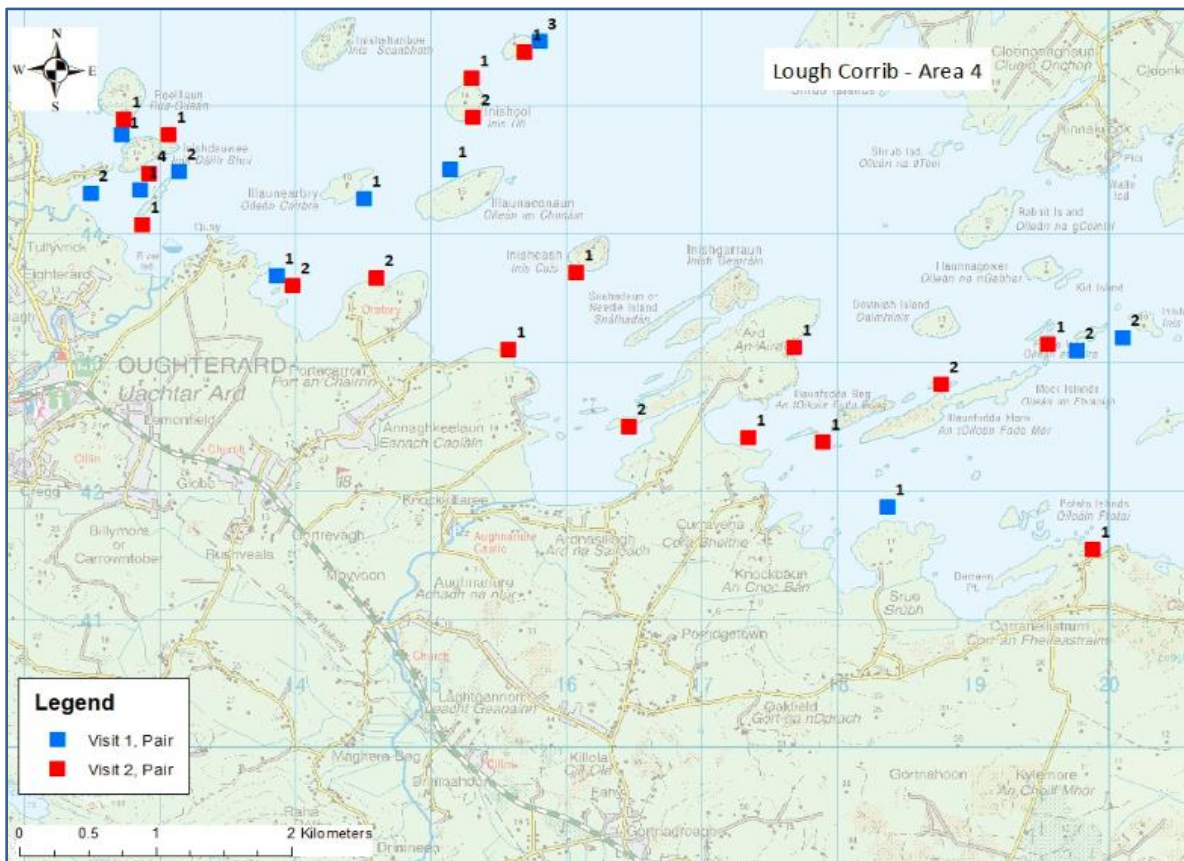


Figure 5a Common Scoter distribution in Area 4 on Lough Corrib, 2020 (pairs only). Numbers associated with each symbol denote the number of pairs or individuals recorded.

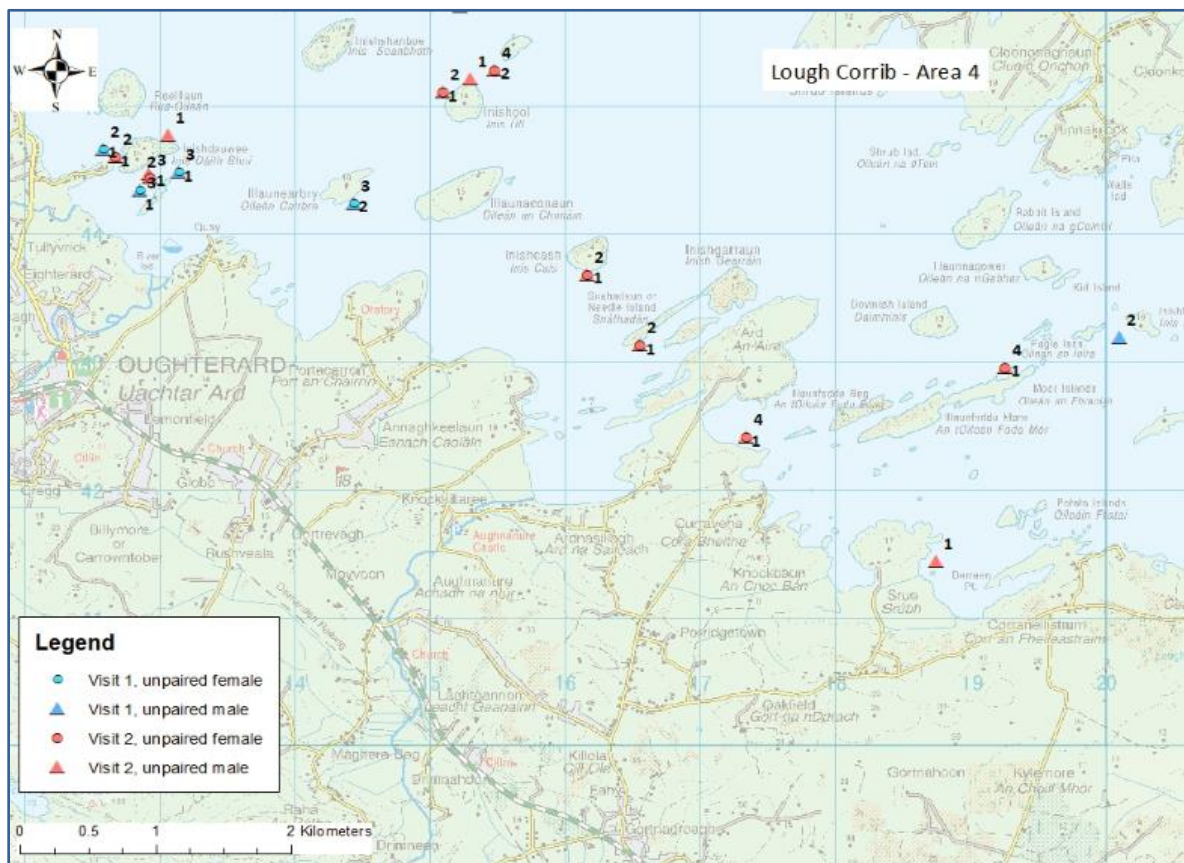


Figure 5b Common Scoter distribution Area 4 on Lough Corrib, 2020 (single birds only). Numbers associated with each symbol denote the number of pairs or individuals recorded.

Oughterard-Ard area on July 30th by Larry McCarthy (boat operator and second observer on the 2020 Common Scoter survey). The groups of female scoter recorded during these visits are assumed to be failed breeders (groups). On three occasions during the early brood visits a single female bird was observed close to shore and potential nest habitat. These females were feeding intensively. Broods were subsequently found at the same location as these single females had been recorded and they are assumed to have been incubating birds.

On Lough Corrib there was a wider pre-breeding distribution in 2012 compared to 2020. In 2020 both pre-breeding birds and broods were found in the Doorus, and Oughterard-Ard areas of Lough Corrib. The Oughterard-Ard area covers two distinct areas one at Oughterard Bay (Roeillaun, Inishdauwee) and the other around Ard Point and extending south to a group of islands locally known as the “Fugis” (Illaunfadda more, Illaunfada Beag and surrounding islands) (Figure 7). In contrast to 2012 when broods were found in Oughtereard Bay only, in 2020 they were also found at Ard Point and the “Fugis”.

Table 7 Results from brood surveys on Lough Corrib, showing age class distribution, total ducklings, total broods, and numbers of adult females without broods. Within age classes: commas separate individual broods; underlined broods indicates brood with parent; and an asterisk indicates a suspected crèche. Distinct records (individual or groups) of adult females without broods are separated by a comma.

Area/date	Age Class I			Age Class II			Age Class III	Total ducklings	Total broods	Females without broods
	a	b	c	a	b	c				
Area 2:										
11 th July	<u>6</u>	0	<u>3</u>	0	0	0	0	9	2	5,4
19 th July	0	0	<u>6</u>	0	0	0	0	6	1	7
2 nd Aug	0	0	0	0	0	6	0	6	1	0
17 th Aug	0	0	0	0	0	0	0	0	0	0
Area 4:										
11 th July	0	0	0	0	0	0	0	0	0	3,3,2,2,2
19 th July	<u>8</u>	11*	0	0	0	0	0	19	3	5,5,1,1
2 nd Aug	<u>1</u>	<u>9,7,4</u>	0	0	0	0	0	21	4	0
17 th Aug	0	0	<u>8,7</u>	0	<u>1,4</u>	0	0	20	4	0
30 th Aug	0	0	0	<u>7</u>	0	<u>1,3,4</u>	0	15	4	0
Area 5:										
10 th July	0	0	0	0	0	0	0	0	0	3
Total number of ducklings hatched								42		
Total numbers of ducklings lost								21		
Total number of ducklings reaching class II								21		
Maximum number of broods								8		
Productivity (ducklings reaching Class II/ potential breeding pair)								0.55		
Breeding success (broods/potential breeding pair)								21%		

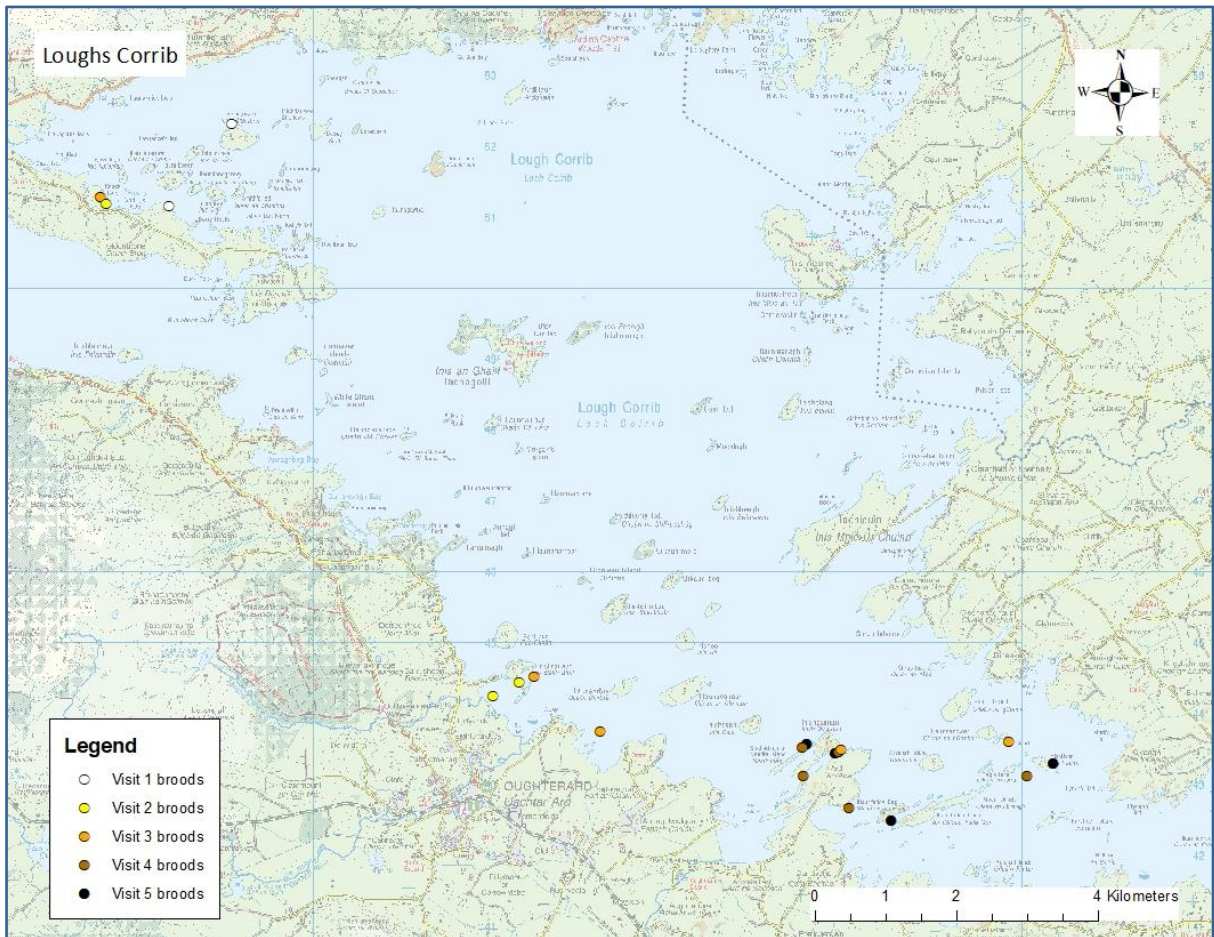


Figure 7 Distribution of broods during brood surveys of Lough Corrib, 2020.

3.2.2 Lough Ree

Pre-breeding census

At Lough Ree seven potential pairs of Common Scoter were recorded on the first visit and two on the second visit (Table 8). Eleven single male Common Scoter were recorded on the first visit and four on the second. No single female scoters were recorded on either visit. The male female ratio was 2.6 males to 1 female on the first visit, and 3 males to 1 female on the second visit.

Table 8 The number of pairs and individual adults recorded on Lough Ree in visit 1 and visit 2.

Visit	Definite pairs	Probable pair	Single adult male	Single adult female	Potential pairs	Ratio Male: Female
Visit 1	5	2	11	0	7	2.6:1
Visit 2	1	1	4	0	2	3:1

Pre-breeding distribution

During the pre-breeding survey of Lough Ree all Common Scoter were found associating with the three east Islands of the Black Islands (Nut, Red and Long) in the mid - section of Lough Ree (Figure 8 & 9). Common Scoter were found only in this area of Lough Ree in both visit 1 and visit 2.

Other observations

During the pre-breeding survey six observations were made of Common Scoter associating with islands Nut Island is classified as wooded grazed with open areas grazed possibly by goats and the other two islands (Red and Long) are completely wooded. Common Scoter were mainly observed loafing with one feeding observation.

A small colony of Lesser Black-backed gulls (*Larus fuscus*) is present at the Black Islands and a larger colony (c. 250 breeding pairs estimated in 2020) on Incharmadermot island at the north end of Lough Ree. While predation of scoter duckling was not observed, the potential for predation owing to the presence of these colonies was highlighted.

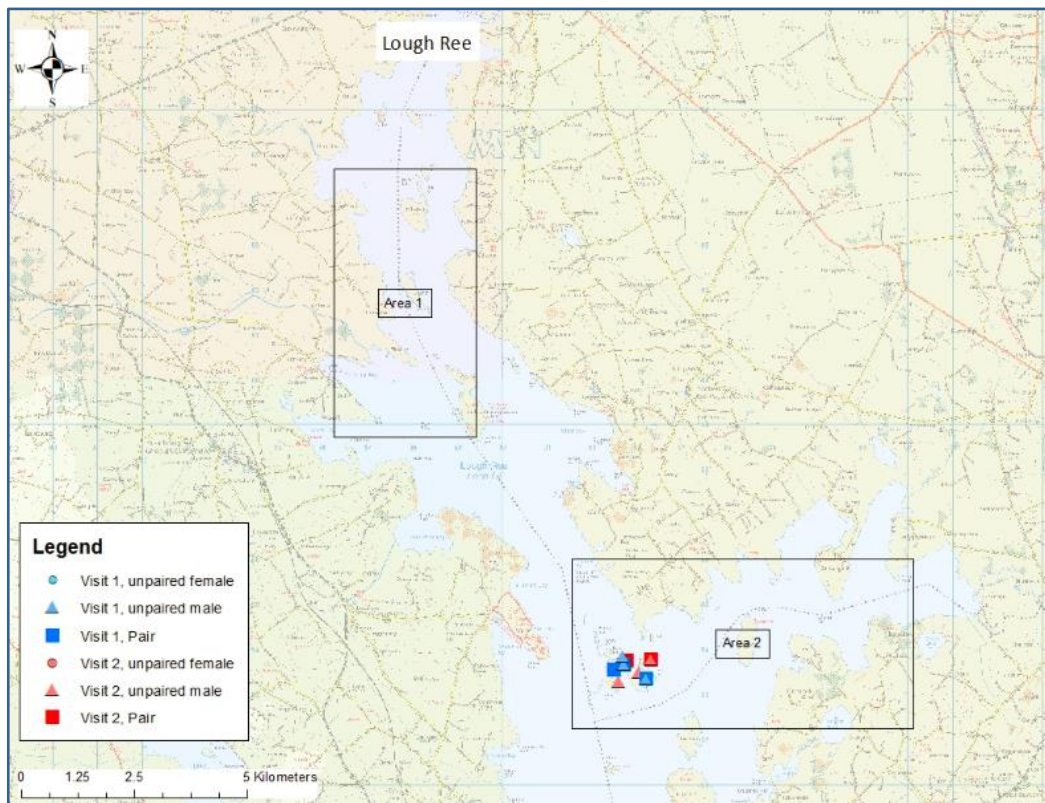


Figure 8 Overview of distribution of Common Scoter recorded during the 2020 pre-breeding survey on Lough Ree. Common Scoter were recorded in Areas 1-2 during the 2012 survey; these are retained and displayed for consistency and comparison.

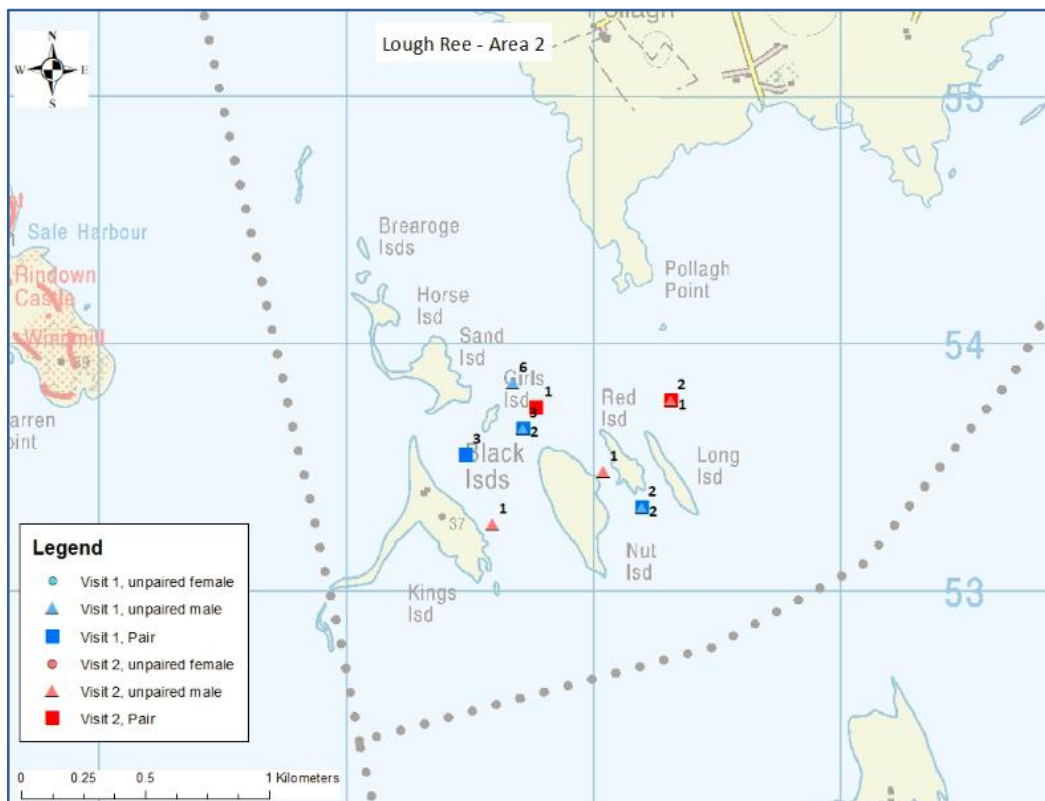


Figure 9 Common Scoter distribution in Area 2 on Lough Ree, 2020. Numbers associated with each symbol denote the number of pairs or individuals recorded.

Brood survey

From a total of seven potential pairs, five broods, comprising a maximum of 24 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 8). Common Scoter were recorded from this area during the pre-breeding survey. Breeding success was 71% and productivity was 1.1 ducklings per breeding pair.

The first visit (8th July) found five broods in four groups, one group was a crèche of 10 ducklings. The second and third visits (29th July & 11th August) also recorded five broods. The broods were all of similar age and tracking broods was difficult. The crèched brood of 10 ducklings found in the first visit appeared to have lost three ducklings by the second visit and split into two broods: one of three and one of four ducklings. On the third visit this crèche is assumed to have reformed as four ducklings based on location and behaviour. The third survey in August recorded eight ducklings of an older age class, as expected (Table 9). Given that 16 ducklings were lost between the first and the third visits on Lough Ree and eight were recorded on the third visit, a total of eight ducklings were produced from five broods. Note: although 10 ducklings reached class IIa further surveys reported only eight ducklings of this brood at class IIc and this number was used to estimate productivity (see Table 9).

In both 2012 and 2020 broods were only present around the Black Isles on Lough Ree. In 2012 the pre-breeding distribution covered a wider area than in 2020.

Table 9 Results from brood surveys in Area 2 of Lough Ree, showing age class distribution, total ducklings, total broods, and numbers of adult females without broods. Within age classes: commas separate individual broods; underlined broods indicates brood with parent; and an asterisk indicates a suspected crèche. Distinct records (individual or groups) of adult females without broods are separated by a comma.

Date	Age Class I			Age Class II			Age Class III	Total ducklings	Total Broods	Females without broods
	a	b	c	a	b	c				
8 th July	0	<u>1,6</u> <u>7,10*</u>	0	0	0	0	0	24	5	0
29 th July	0	0	0	<u>1,1</u> <u>3,4</u>	<u>1</u>	0	0	10	5	0
11th Aug	0	0	0	0	1,2,4*	1	0	8	5	0
Total number of ducklings hatched								24		
Assumed duckling mortality								16		
Total number of ducklings reaching class II								8		
Maximum number of broods								5		
Productivity (class II ducklings /potential breeding pair)								1.1		
Breeding success (broods/potential breeding pair)								71%		

3.2.3 Lough Arrow

Pre-breeding census

At Lough Arrow four pairs of Common Scoter were recorded on the first visit and two on the second visit. The number of single adult male scoters reduced from five on the first visit to two on the second visit. Single female scoters were not recorded on either visit (Table 10).

Table 10 The number of pairs and individual birds recorded on Lough Arrow in visit 1 and visit 2.

Visit	Definite pairs	Probable pair	Single adult male	Single adult female	Potential pairs	Ratio Male: Female
Visit 1	2	2	5	0	4	2.3:1
Visit 2	2	0	2	0	2	2:1

Pre-breeding Distribution

All the Common Scoter recorded on Lough Arrow were located within the mid-section of the lake (Figure 10). Between visit one and visit two the Common Scoter became concentrated around Muck island.

Other observations

Eight observations were made of Common Scoter associating with islands on Lough Arrow during the pre-breeding Survey. All islands were classified as wooded grazed meaning they have an open area and woodland fringe. All observations were of birds loafing.



Figure 10 Common Scoter distribution on Lough Arrow, 2020. Numbers associated with each symbol denote the number of pairs or individuals recorded.

Brood survey results

From a total of four potential pairs, no broods, were recorded from Lough Arrow. Lough Arrow was surveyed three times during the brood survey on the 8th July, 21st July and the 12th August.

3.2.4 Loughs Conn and Cullin

Pre-breeding census

At Loughs Conn and Cullin a single definite pair of Common Scoter was recorded on visit 2 of the pre-breeding survey. No single female or single male scoters were recorded on either visit (Table 11).

Table 11 The number of pairs and individual birds recorded on Loughs Conn & Cullin.

Visit	Definite Pairs	Probable Pair	Single adult Male	Single adult Female	Potential Pairs	Ratio Male: Female
Visit 1	0	0	0	0	0	0
Visit 2	1	0	0	0	0	0

Pre-breeding distribution

On visit one, no Common Scoter were recorded. During the second visit one pair was recorded from the southern end of Lough Conn on the eastern side of Illaungashy Island (Figure 11 & 12).

Other observations

During the pre-breeding survey, no observations were made of Common Scoter associating with islands.

Brood survey results

Three brood survey visits were completed and no adult scoters or ducklings were recorded during any of the visits.

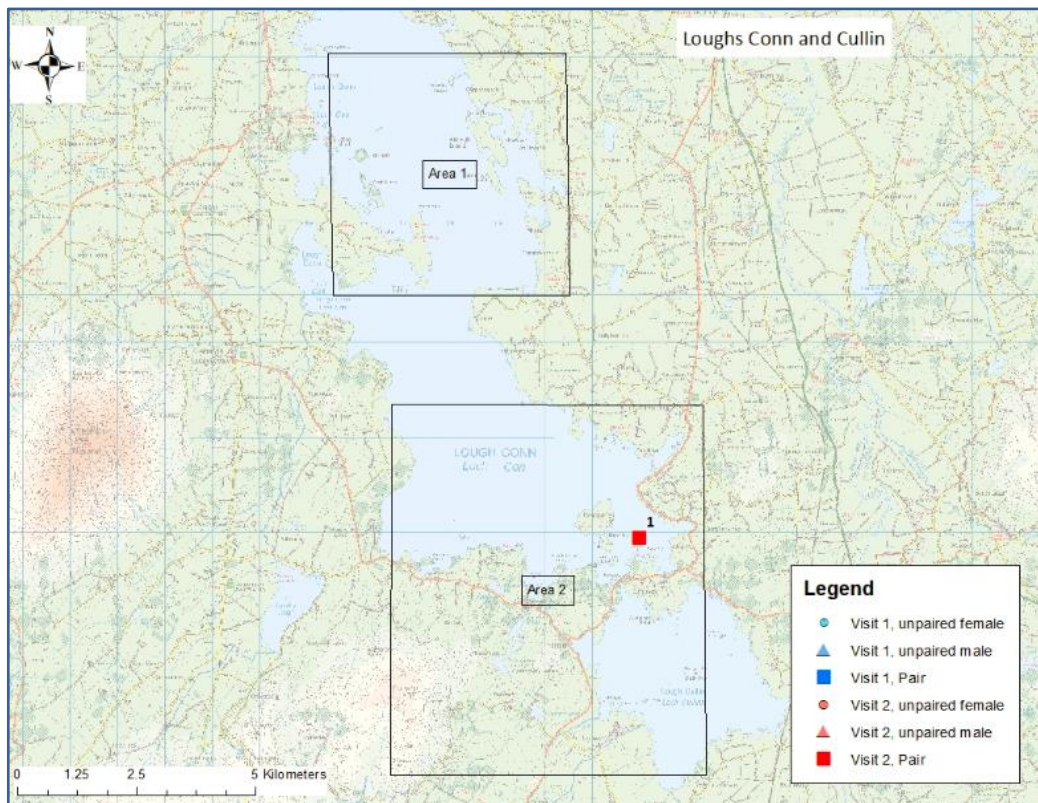


Figure 11 Overview of distribution of Common Scoter recorded during pre-breeding surveys on Loughs Conn and Cullin. Areas 1 and 2 were used during the 2012 survey and have been retained here for consistency. Numbers associated with each symbol denote the number of pairs or individuals recorded.

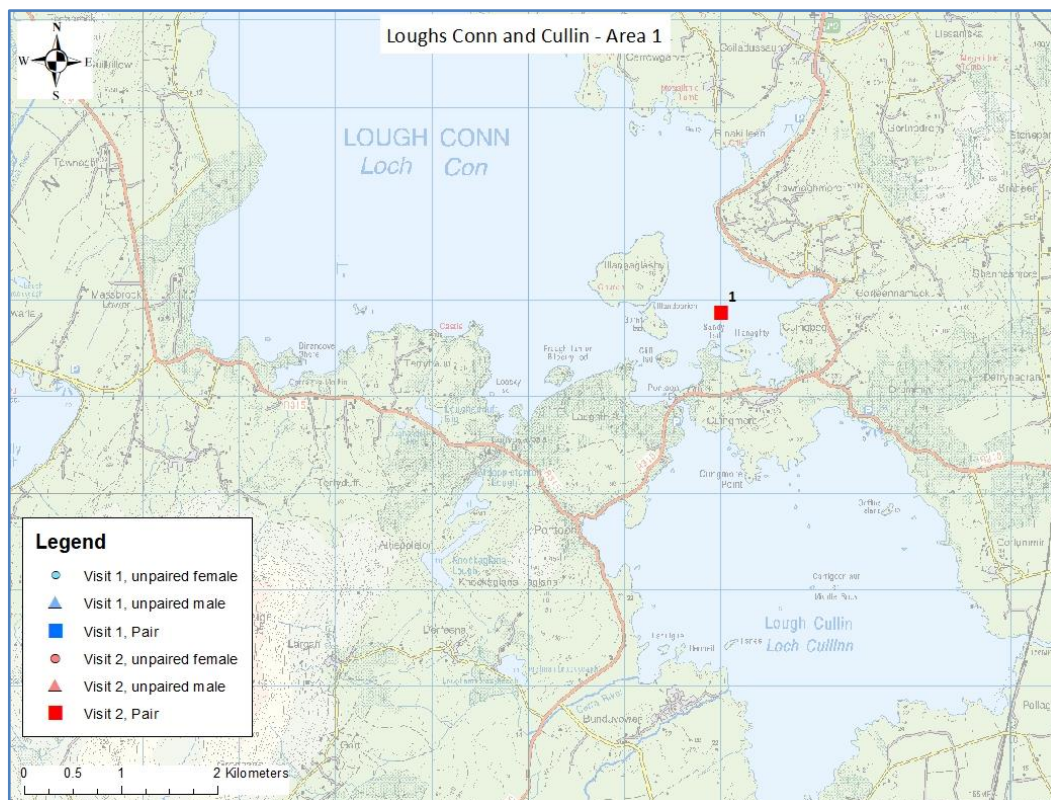


Figure 12 Common Scoter distribution on Loughs Conn and Cullin in Area 2. Numbers associated with each symbol denote the number of pairs or individuals recorded.

3.2.5 Loughs Gara

Pre-breeding census

Lough Gara was surveyed on the 8th, 9th and 21st May 2020. On the 8th of May, a land-based survey was carried out on the southernmost arm of the lough which was inaccessible by boat as a result of very low water levels. The middle arm of the lough was also inaccessible by boat and could not be surveyed from the land, owing to access issues. Scoter normally favour rocky substrate and generally seem to avoid reed-beds in the pre-breeding phase. These areas also lacked suitable island or shoreline nesting habitat. The main part of Lough Gara was surveyed by boat on 9th and 21st May. No scoters were recorded on any of these visits

Other observations

On Lough Gara the majority of aquatic and terrestrial habitat appeared generally suitable for scoters.

Brood survey results

No brood survey was undertaken due to the absence of scoter during the pre-breeding survey.

3.3 Other observations

It was observed (Larry McCarthy, pers. comm.) that in 2020 the pattern of disturbance on Lough Corrib was different to normal due to Covid restrictions. During the pre-breeding survey when tight Covid restrictions were in place low numbers of people were fishing. Normally, the may fly season attracts anglers from the UK and Europe. Restrictions on travel from home were 5 km between the 5th May and 20th June after which the limit increased to 20 km. After that date many day trippers visited Lough Corrib with more pleasure cruisers and more picnicking than a normal year. A similar pattern on Lough Ree would be expected. On Lough Corrib picnicking was observed on several islands and Inchagoill was commonly visited by day trippers because of its archaeological interest.

Observations at Lough Corrib were that pre-breeding Common Scoter were easily approached by boat and remained undisturbed up to around 30 m. During the brood survey females with young and parent less young were easily disturbed and moved away from approaching boats at much greater distances estimated at up to 500 m. On Lough Ree disturbance from angling boats and from anglers fishing from rocks and from small islands around the Black Islands was observed. Disturbance effects were not quantified and impacts on Common Scoter are not known.

Predatory birds were recorded at all the sites. Those noted included Hooded Crow, Magpie (*Pica pica*), Raven and Gulls (Lesser Black-backed Gull *Larus fuscus* and Great Black-backed Gull *Larus marinus*). The threat of Lesser Black-backed gull predation during the brood surveys was noted for Lough Ree. The numbers of Hooded Crow were considered to be higher than other potential avian predators on Lough Corrib in particular.

Predatory mammals noted from the survey were one sightings of Mink from Lough Corrib outside survey dates. Larson traps (for Hooded Crow) were noted as part of the NPWS predator control programme in the north east of the lake.

In 2020 ad hoc observations were made on scoter with paired scoters noted on Lough Corrib on the third week of April 2020 (Larry McCarthy, Pers. Comm.) and records of adult male Common Scoter on Lough Ree in Feb and the first week of March (Owen murphy, Pers. Comm.).

4. Discussion

4.1 The all-Ireland breeding population

The all-Ireland breeding population of Common Scoter has increased from 39 pairs in 2012 to 50 pairs in 2020. Between 2012 and 2020 numbers at Lough Corrib increased from 28 to 38 pairs. Numbers at Lough Ree have shown a slight increase from five to seven pairs. Numbers at Lough Arrow are similar between survey years with five pairs in 2012 and four pairs in 2020. At Lough Conn and Cullin one pair was present in both 2012 and 2020.

While the breeding population remains limited to the same four lakes as in 2012, the results suggest the pre-breeding distribution of scoter within each lake may have contracted. During 2012 Common Scoter were observed over a much larger area of all lakes than in 2020. Further years of data are required to confirm this observation and to investigate possible reasons for this change.

Since 1995 the population trend has been downward with lowest numbers recorded in 2012. The results of the 2020 survey show a small recovery in numbers from the low of 39 pairs in 2012 to 50 pairs in 2020. While the short-term population trend is positive, the population remains considerably smaller than the 80 potential pairs recorded in 1999 (Tierney *et al.*, 2000) and 100 pairs in 1995 (Gittings, 1995).

The 2020 the male: female ratio in the national population remains similar to that in 1999 and in 2012, however it is less balanced than in 1995 (Table 12). This masks site level changes with Lough Ree showing an increase in the number of males to females (2.4:1 in 2012 to 2.8:1 in 2020) and Lough Corrib showing a similar ratio to 2012 (1.3:1 in 2012 and 1.4:1 in 2020). The ratio at Lough Arrow remains similar between surveys. It has been shown that with a decline in the breeding population the male to female ratio becomes increasingly imbalanced. 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). While the 2020 results show an increase in breeding numbers, the male: female ratio at all sites except for Lough Corrib remains skewed and indicative of a breeding population under stress.

Table 12 Population structure for the all-Ireland population 1995-2020.

Year	Total Female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male: female ratio
1995	100	123	223	28	5	95	1.2:1
1996	93	111	224	34	16	77	1.2:1
1999	80	131	211	70	19	61	1.6:1
2012	39	67	106	30	2*	37	1.7:1
2020	50	82	130	39	7	43	1.6:1

The importance of sex ratios in relation to population growth and viability is described by Ramula *et al.* (2018) in relation to Eider ducks and by Pöysä *et al.* (2019) in relation to diving ducks. Male bias ratios are described as normal in birds, with the skew being particularly pronounced in endangered species and small population sizes. Possible reasons for a male bias include predation and stress associated with breeding females. Female ducks are likely to be disproportionately affected by predation when incubating. The energetic cost of breeding affecting body condition may be another cause of mortality. Both studies stress the complexities of understanding the causes of sex ratio bias and while both stress and predation seem plausible factors for the bias in the Irish population, data is lacking and research is required.

Studies of Blue-winged Teal hens (*Anas discors*) demonstrated the stresses upon breeding females. Hens were studied under natural conditions during the reproductive season of 1966 and 1967 to investigate the hypothesis that reproduction predisposes female waterfowl to stress-associated mortality (Harris, 1970). Physiological parameters were monitored during pre-laying, laying, and incubation periods. It was noted that a rapid loss in body weight was associated with the onset of incubation. Thus, some loss of condition during breeding may increase female mortality (Harris, 1970).

4.2 Breeding success and productivity

4.2.1 Breeding success

Results from the 2020 brood survey show that for a population with a maximum of 50 potential breeding pairs, 13 broods were produced (Table 4). In 2020 productivity (all sites) was 0.58 compared to 0.8 in 2012, while breeding success was 28% in both years.

Despite total breeding numbers showing a positive trend, only two of the four lakes with breeding Common Scoter (Lough Corrib and Lough Ree) produced young compared to three lakes in 2012 (Lough Corrib, Lough Ree and Lough Arrow). As for previous surveys, broods were found in the same areas as the pre-breeding population.

In both 2012 and 2020 broods were only present around the Black Islands on Lough Ree despite a wider pre-breeding distribution in 2012. The pattern on Lough Corrib was similar with a wider distribution pre-breeding distribution in 2012 compared to 2020. On Lough Corrib the expansion in both successful nesting and brood rearing areas observed in 2020 is positive and if sustained may reduce the vulnerability of ducklings to local events or pressures. These results are from one survey year only and further data is required to confirm any change.

Breeding success (number of broods/potential breeding pair) was 21% at Lough Corrib compared to 71% at Lough Ree. The number of broods per breeding pair appears particularly low on Lough Corrib where just eight broods were produced from 38 pairs. On Lough Ree, in contrast, five broods were produced from just seven pairs.

Poor breeding success at Lough Corrib may result from many factors such as failure to breed (poor breeding condition), breeding deferral, insufficient food resources (nesting females), unsuitable or disturbed nesting habitat, predation of nesting females and predation of eggs and newly hatched young. It may also be the case and has been observed at Scottish sites, that some females present during pre-breeding, do not in the end attempt to breed.

The high breeding success rate at Lough Ree compared to Lough Corrib may be attributed, at least in part, to the predator control programme at this site. In recent years, the predator control on Lough Corrib has been comprised of areas at the southern tip of the lake being covered by BirdWatch Ireland (BWI; as part of the Curlew EIP) and islands in the very northern area covered under the NPWS Curlew Conservation Programme. It is possible that predator control on Lough Corrib may not benefit Common Scoter in the same way as it does on Lough Ree due to differences in scale and coverage. Lough Corrib is a large and complex lake and the scoter are distributed over a much wider area. A predator control strategy targeted specifically at Common Scoter nest areas is likely to be required.

Unlike many other waterbirds Common Scoter cannot lay a second clutch if their first attempt fails. The male Common Scoter disperse to sea normally shortly after egg laying (Underhill *et al.*, 1998) and so are unavailable to the females for relaying. Departure of the male is also likely to increase the risk of predation and the energetic costs associated with breeding.

The 2020 brood survey data is from one year only, with the most recent comparative Irish data from eight years previous in 2012. The 2020 data will reflect the particular weather conditions, lake levels and

other factors of that year, which may have influenced breeding success. The need for further data to properly assess and understand population trends is clear.

4.2.2 Productivity

Of the 66 ducklings recorded during the brood survey, 29 (44%) of them survived to class II and productivity was estimated at 0.58 ducklings per potential breeding pair. Productivity at Lough Corrib was 0.55 ducklings per breeding pair, much lower than Lough Ree with 1.1 duckling per breeding pair. The lower productivity at Lough Corrib is clearly linked to the low breeding success, with many pairs either failing to breed or failing to produce ducklings which survived to the first brood survey. At Lough Ree an estimated five out of seven potential pairs produced broods. Survival to age class II is comparable across these lakes with 50% of ducklings recorded on Lough Corrib reaching class II and 42% of those recorded on Lough Ree reaching class II. This suggests that, for 2020, failure to successfully nest and/or mortality at the early brood or egg stage was the cause of low productivity rather than duckling survival (at least beyond the first few days and to age class II). The hazards of the first few days of a duckling's life are evident, for example, from observations of Red-throated divers nesting on loughs in Scotland. Divers have often been recorded hatching young only for the entire clutch to be lost within 24 hours (Mark Hancock, RSPB, pers. comm.).

At breeding sites in the Flow Country of northern Scotland, it was found that once productivity exceeded 0.60 young per pair the population tended to increase the following year (Mark Hancock, RSPB, pers. comm.). Applying this data to Ireland suggests that numbers at Lough Ree may continue to increase, if this year's data is representative of a long term trend. The increase in breeding numbers from five pairs to seven pairs may provide further evidence of this. However, the estimate of how many fledged ducklings per female leads to population stability is based on the demographic parameters of the Scottish breeding population. Such data is required for the Irish breeding population if accurate assessments of population viability are to be made. This will likely require a considerable increase in survey effort.

Regular pre-breeding and brood survey monitoring is required to assess if the data from Scottish breeding sites can also be applied to Irish breeding sites. Furthermore, productivity data for Common Scoter is based on survival to age class II (c. 30-40 days) and does not account for mortality between age class II and fledging. In addition, Common Scoter survival at their wintering grounds is unknown. The numbers of Common Scoter produced on the island of 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. Further research and monitoring is required to address these unknowns.

Although based on a few observations in 2020 it is of note that duckling survival with parents in attendance was greater than without. Three broods on Lough Corrib (one at Ard, one at Fugis and one at Doorus) were successfully observed with their parent in the same areas on successive visits. Both parent presence and fidelity to nest site appeared to favour duckling survival. In contrast a crèche of 11 ducklings were recorded without a parent on the 19th of July and despite searching specifically for this crèche it was not found again.

4.3 Site accounts

4.3.1 Lough Corrib

Lough Corrib became a known breeding site for scoter 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 13). The 2012 survey found 28 pairs, indicating a possible downward trend in breeding numbers but the 2020 survey shows an increase to 38 potential pairs. The male to female sex ratio has become less balanced since the mid 1990's though is comparable to 1999.

The distribution of Common Scoter on Lough Corrib remains largely similar in 2020 to that of 1995, 1996 and 2012. The population remains concentrated within the upper lough, with greatest breeding numbers in the areas of Doorus and Oughterard-Ard. While Common Scoter in 2020 remain in these same key areas, they were recorded over a wider area of the upper lough during the pre-breeding survey in 2012 than in 2020 (Figure 2).

Table 13 Common Scoter population structure on Lough Corrib 1995-2020

Year	Total female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male: Female ratio
1995	30	34	64	5	1	29	1.1:1
1996	40	38	78	8	10	30	1.0:1
1998	31	36	67	9	4	27+	1.2:1
1999	36	51	87	19	4	32	1.4:1
2012	28	36	65	10	3*	26	1.3:1
2020	38	55	93	23	7	38	1.4:1

*Includes single immature female which is not included in the total number of possible breeding pairs

Pairs of Common Scoter were seen on Lough Corrib in the third week of April (Larry McCarthy, pers. comm). During the pre-breeding survey pairs were observed on Lough Corrib on the 8th May and class Ia (1-5 days old) and class 1c (13-18 days old) ducklings were recorded on the first visit (11th July). With an incubation time of approximately 37 days it is estimated that incubation began around the 22nd May with hatching commencing around the 28th June. This is similar to 2012 (incubation start estimated as 28th May) and 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 3rd July 1997 and 7th of July 1998 and 1999.

In 2020 newly hatched ducklings (class Ia) were recorded during the second visit (19th July) and the 3rd visit (2nd August). Tierney (2001) noted that all ducklings had gone from Lough Corrib by the 18th, 19th and 26th August in 1997, 1998, 1999 respectively. In 2012 no ducklings were recorded after August 7th. In 2020 ducklings (class IIc) were found on August 30th (fourth brood visit). The brood survey data for 2020 suggests both earlier hatching (than in the 1990's) and a more protracted laying period (compared to both the 1990's and 2012). These differences are considered with caution. Difference in sample size and survey effort between the 2012 and 2020 surveys and those of the 1990's may have a bearing on these results.

Assuming that all females counted on Lough Corrib attempted to breed, breeding success was low at 21%, when compared to Tierney (2001), but was similar to Hunt *et al.* (2012; 18%). Using data from brood surveys over three years (1997-1999) Tierney (2001) estimated breeding success to be 34.7%. Brood size on Lough Corrib in 2020 ranged from one to nine ducklings, similar to brood sizes in 2012. One brood of eleven was considered to be a crèche. One brood noted on the 2nd Aug consisted of a single duckling, suggesting predation at the new duckling stage. Duckling counts by Tierney (2001) included several crèches and some were also known or suspected during this survey. Tierney (2001) recorded a mean brood size of 5.8 whereas this 2020 survey found a mean brood size of 5.25. In 2012 the mean brood size was similar at five.

It was assumed by Tierney (2001) that once ducklings reached age class IIc they were likely to survive to fledgling. Tierney observed that low breeding success on Lough Corrib was followed by the disappearance of ducklings at a considerable rate from study areas as they mature (Table 14). In 2020 the number of ducklings at age class Ia to Ic was similar to that found by Tierney (2001) and slightly higher than by Hunt *et al.* 2012. Of those ducklings recorded at age class I, their estimated survival rate to age class IIa and IIb was lower in 2020 than 2012 and similar to survival reported by Tierney (2001). Survival between the intermediate and old age class was similar in 2020 to 1999, however differences in

survey method may be a factor in these comparisons. The final Lough Corrib brood survey in 2012 (Hunt *et al.*, 2012) was on the 7th of August and no ducklings were recorded; given the lateness of the survey this could not be interpreted as a negative result, therefore no result is presented for 2012 in this age class.

Table 14 Productivity on Lough Corrib across three age categories, showing the number of ducklings per potential pair in each age category for 1997-1999 (following Tierney, 2001), 2012 (Hunt *et al.*, 2012) and 2020.

Year	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	*
2020	1.10	0.55	0.36

In 2020, the Lough Corrib Common Scoter duckling population appears to have been vulnerable between young and the intermediate classes. Only eight broods were produced from a potential breeding population of 38 pairs, suggesting failure to breed, failure to successfully hatch young and/or failure of newly hatched young to survive. The number of broods is only slightly more than the 2012 where five broods were produced from a potential breeding population of 28 pairs.



Figure 13 Young Common Scoter ducklings class Ic on Lough Corrib Doorus 19th July 2020. Photograph: Marie Louise Heffernan.

While only adult birds were recorded during the pre-breeding survey. Poor condition in breeding females and breeding by young inexperienced birds may be linked with nest failure (*e.g.* Garrick *et al.*, 2017). Poor condition may result from a number of factors including inadequate feeding at breeding or wintering sites.

Male Common Scoter leave for their wintering grounds post-breeding. During the brood surveys male scoter were absent except for a single male recorded at Ard on two brood survey visits at exactly the same location. On both occasions the male associated with other scoter. 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 and second brood survey (11 and 19th July) in the Oughterard-Ard and Doorus areas, female scoter were recorded in groups. On the 11th July there were 11 female scoter at Doorus, 12 at Oughterard-Ard and three at Inchiquin-Inishmacatreer. This is a total of 26 females. On July 19th 19 female scoter and a large group of 13 were noted by one of the observers on the 30th July. In previous surveys groups of immature females (13-15 birds) have been recorded during pre-breeding surveys in May (Hunt *et al.*, 2012). However, the groups recorded during the brood surveys are suspected to be the females recorded in the pre-breeding survey that have failed to breed and are gathering before they return to wintering grounds at sea. By the 2nd August no further groups of female scoter were recorded on Lough Corrib. Groups of failed breeders were also observed in the 2012 survey. As in 2012 suspected failed breeders left the lake around mid-July.

In 1996, when the Lough Corrib population was 40 pairs, Delaney and Gittings (1996) speculated that it was set to rise further. The population is now back at a similar level to 1996 suggesting a recovery from the low number of 28 pairs in 2012. The pattern of decline from duckling to fledging is very similar to that recorded by 1999 (Tierney, 2001). The male to female ratio is also the same in 2020 as was recorded in 1999. In 2012 the pre-breeding survey found that Common Scoter in five areas of the lake and successful breeding was only recorded from one of these areas. In 2020 the pre-breeding range may have been smaller but broods were recorded from a wider area.

Adequate feeding for adult and young scoter is an important factor in breeding success and duckling survival. Significant changes in food supply have occurred in Lough Corrib in the last 20 years since Tierney (2001). In particular, the arrival of zebra mussel *Dreissena polymorpha* which was recorded on Lough Corrib in 2006 (Biodiversity Ireland, 2020) and is now present in much of the upper lake. Molluscs are an important part of Common Scoter diet in their wintering grounds (Kottsieper *et al.*, 2019a) and the availability of the zebra mussel may now provide an important feeding resource on Lough Corrib. Common Scoter are known to adapt to non-indigenous bivalve species as a food resource. Kottsieper *et al.* (2019b) have shown that on the eastern German North Sea coast the invasive American razor clam *Ensis. leei* has become an important prey item for internationally important concentrations of Common Scoters at large spatial scales. Research is needed to be establish if the zebra mussel now forms part of the Common scoter diet at Irish breeding sites.

Another invasive the Curly Pondweed *Lagarosiphon major* is known from Lough Corrib since 1991 and has been widespread since 2006. There is an ongoing control programme in place by Inland Fisheries Ireland to prevent its spread (Caffrey *et al.*, 2011); this involves cutting the weed and laying biodegradable jute matting on the lakebed. Both the presence of Curly Pondweed and its control may impact on invertebrates which are an important feeding resource for Common Scoter.

In 2013 the ecological condition of Lough Corrib Upper was classified as poor (EPA, 2013). More recently it is classified as Good status under the Water Quality Status data for Lake Waterbodies 2013-2018 (EPA, 2020). However, Lough Corrib serves a huge catchment with an area of 3,138 km² and with several towns discharging into it. There are also pressures from agriculture and forestry which will also impact on water quality. Common Scoter rely on invertebrates for feeding which is influenced by water quality. Invertebrate density was found to be a key factor in scoter breeding success in Scotland. Lakes where the average weight of the largest invertebrate in each sample exceeded 4 mg had 9.2 times more females and 27 times more broods than other lakes (Hancock *et al.*, 2016). The link between water quality, the invertebrate community and breeding success requires further consideration.

Predation is another factor likely to influence breeding success. During the pre-breeding and brood surveys the most frequently recorded potential predator on Lough Corrib was the Hooded Crow.

Predation by Hooded Crows, along with Mink, and Pike *Esox lucius* may influence breeding success. Mink has been present on Lough Corrib since at least since 2000 (Biodiversity Ireland, 2020). Mink trapping to the south of the lake is undertaken by BWI under the Curlew European Innovations Partnership (Kathryn Finney, BWI, pers comm). NPWS have a predator control programme on upper Lough Corrib Inland Fisheries Ireland continue to 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). Predation may explain, at least in part, the low level of productivity at Lough Corrib.

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 are likely to be affecting other breeding waterbirds at this site.

4.3.2 Lough Ree

Lough Ree was the stronghold of the Irish Common Scoter population in 1995 with 39 pairs (Table 15). However, between 1995 and 2020 the number of potential breeding females on Lough Ree has declined by 82%. This downward trend reached a 20 year low in 2012 when only five breeding pairs were recorded. A small increase to seven pairs in 2020 with a total of 25 Common Scoter (compared to 17 in 2012) is positive. However, the male to female ratio in 2020 was 2.6 male Common Scoters to one female slightly more skewed than recorded in 2012 (2.4:1)

In 2012 the breeding population remained located on the northern half of the lake and particularly around the Black Islands, as found in the 1995 and 1996 surveys. In 2020, the population was concentrated around the Black Islands.

Table 15 Scoter population structure on Lough Ree 1995-2020.

Year	Total female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male: Female ratio
1995	39	48	87	11	2	37	1.2:1
1996	35	47	82	16	4	31	1.3:1
1999	32	50	82	29	11	21	1.6:1
2012	5	12	17	7	0	5	2.4:1
2020	7	18	25	11	0	7	2.6:1

During the first brood survey in 2020, the ducklings found at Lough Ree were of similar age to those found in Doorus in the northern part of Lough Corrib. The Lough Ree broods were age class Ib on the 8th July and three days later class Ic were recorded at Doorus. This suggests that pairing and incubation occurred earlier at both Lough Ree and at Doorus on Lough Corrib than elsewhere. Lough Ree broods were also recorded earlier than other sites in the 2012 survey. No broods were found at Doorus in that year.

Breeding success (broods per potential pair) at Lough Ree was high at 71% compared to 21% on Lough Corrib. High numbers of ducklings were counted with 24 recorded at Lough Ree compared to 42 on Lough Corrib. Ducklings (class II) produced per potential pair was 1.1 on Lough Ree and 0.55 on Lough Corrib. Average brood size at Lough Ree in 2020 was 4.8 ducklings assuming two crèches recorded on the first and last brood survey. The key difference between Lough Corrib and Lough Ree is that most pairs recorded in the pre-breeding survey on Lough Ree successfully nested, laid eggs, hatched young and the young survived the first few days of life, to be recorded as ducklings.

The predation management undertaken by NPWS in the North Midlands Region, controls four species: Hooded Crow, Magpie, Mink and Fox (*Vulpes vulpes*). Hooded Crow were not recorded during brood and pre-breeding surveys on Lough Ree and their absence was noted by the Common Scoter surveyor,

Chris Benson. The Common Scoter population on Lough Ree albeit small is likely to be benefitting from predator control at this site. It seems likely that this is a factor in the higher breeding success (less egg and chick predation) at Lough Ree compared to Lough Corrib.

Owen Murphy (NPWS Warden for Lough Ree and Mid-Shannon Callows) and Common Scoter surveyor Chris Benson have observed that Lesser Black-backed Gulls may be a threat to duckling survival at Lough Ree. These birds are increasing on the lake with a small colony of up to 25-30 pairs on King's Island (one of the Black Islands) in 2020 up from year four or five pairs in 2019 (Owen Murphy, pers comm.) A larger established colony is also present at the north end of the lake. Other potential predators are Greater Black-backed Gull (*Larus marinus*), Raven, Buzzard (*Buteo buteo*), Grey Heron (*Ardea cinerea*) and Pike. The Lesser Black-backed gull and Raven populations are both considered to be the greatest threat (Owen Murphy, pers. comm); these species have not been targeted in this regard.

In previous surveys the association between Common Scoter and wooded grazed islands has been observed. On Lough Ree the Black Islands are wooded with no large areas of grazing. Although there are goats on the islands they are present in small numbers and during the summer, the growth rates of grass, reed and rushes is higher than the grazing pressure leaving necessary cover for breeding birds.

An additional threat to breeding Common Scoter on Lough Ree are changes in lake water levels which are controlled by the Electricity Supply Board (ESB) as part of the Shannon Hydroelectric scheme at Ardnacrusha. On occasion water levels are allowed to rise significantly after heavy rains in the breeding season with the potential to inundate nests, resulting in failure.

In 2020 breeding success (71%) and productivity (1.1 ducklings/breeding pair) were both high on Lough Ree and the number of breeding pairs have increased slightly since 2012. Although this trend is positive the small breeding population at Lough Ree coupled with an increasingly unbalanced sex ratio suggests that its future as a breeding site remains insecure.

4.3.3 Loughs Conn and Cullin

Lough Conn and Lough Cullin only had one pair and no broods present in 2020 and in 2012. These lakes had supported a stable population of around 30 pairs between 1968 and 1995 (Tierney, 2001) but by 1999 breeding numbers were severely diminished, with only seven pairs. A pre-breeding survey of this site in 2004 (Heffernan & Hunt, 2004) confirmed a trend of decline with only three potential breeding pairs recorded. With only one breeding pair found in 2012 and 2020, and no evidence of successful breeding, extirpation of Common Scoter from this site would appear inevitable (Table 16).

Table 16 Common Scoter population structure on Lough Conn & Cullin 1995-2020.

Year	Total female	Total male	Total birds	Unpaired males	Unpaired females	Pairs	Male: Female 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
2020	1	1	2	0	0	1	1:1

The collapse of the Loughs Conn and Cullin from around 30 pairs to a solitary pair in 2012 and again in 2020 is likely to be linked to considerable ecological changes that have taken place in this lake. Of note

in 2020 was the fact that only the one pair of scoter were found on Lough Conn whereas in 2012 an unpaired male scoter and a large group (15) of immature females were also recorded. The latter were considered transient non breeders and were not included in the breeding population estimate. This suggests Loughs Conn and Cullin may no longer be suitable for Common Scoter.

The collapse of the Loughs Conn and Cullin breeding scoter population from 30 pairs in 1985 to one pair in 2012 is likely to be linked to 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 in 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 (*Rutilus rutilus*) per fishing effort (Catch per unit effort - CPUE) in the country (Inland Fisheries Ireland, 2010; Kelly *et al.*, 2013).

It appears that the major decline in scoter populations between 1995 and 1999 also coincides with the peak of the serious deterioration of water quality, with water quality likely directly impacting invertebrate prey abundance.

It is expected that Common Scoter will disappear entirely from this lake within the next few years. The definitive reasons for their decline are unclear, however if this site is to become suitable again in the future a catchment wide approach to water quality, trout conservation and invasive species actions is likely to be required. The benefits of this will reach beyond the conservation actions required just for Common Scoter. To identify why Common Scoter no longer breed at this site, may be informed by identifying why they now appear to favour Lough Corrib.

4.3.4 Lough Arrow

Although Lough Arrow continues to be used by scoter the numbers remain low with just four pairs recorded in 2020. Lough Arrow has only been used by scoter since 1999, when five pairs were recorded (Tierney, 2001). Pre-breeding numbers of five pairs were recorded in 2012 but in that year breeding was successful and three broods hatched. No broods were found in 2020. There is little data for Lough Arrow and it is hoped that future surveys may show increased breeding success at this site.

4.4 Assessment of survey accuracy

4.4.1 Timing of survey

Pre-breeding survey

Based on studies in the Flow Country of Scotland (Underhill *et al.*, 1998), the period for the pre-breeding census of Common Scoter is considered to be between 1st of May and 21st June (Gittings, 1995 and Delaney & Gittings, 1996). However, since 1996, research on Lough Corrib (Tierney, 2001) identified the two week period 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 it was found that the number of females on Lough Corrib

declines, as they began nesting. All site visits in this survey were completed within the optimal survey period as recommended by Tierney (2001).

While the breeding period varies between sites the optimal survey dates and two survey visits within the survey period remain appropriate. During the pre-breeding survey on Lough Corrib, Lough Arrow and Loughs Conn and Cullin the highest numbers were recorded on the second visit. Breeding appears to have been earlier on Lough Ree and so the second survey revealed lower numbers than the first but it is suspected that birds had begun nesting and were thus not visible on the lake. It may be that timing on Lough Ree differs owing to environmental factors or prey availability. It is of note that this lake is the farthest from the sea.

Brood survey

Tierney (2001) completed brood surveys between mid-July and the 17th August following Partridge and Smith (1988). Tierney (2001) 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 (and beyond) in 2020. This gave good coverage of broods present and it was possible on Lough Corrib (but not on Lough Ree due to the high numbers of birds in the same area and the same age class) to easily track the progress of the separate broods through the age classes. Productivity was based on the numbers of ducklings reaching class II and it is assumed that these birds are likely to fledge.

There was considerable variability between the lakes in terms of brood age. Lough Ree was surveyed on the 11th of August and ducklings reaching class IIc were recorded at this time. The final brood survey on Lough Corrib was undertaken on the 30th of August and most ducklings were class IIc though some were still IIa. Hatching appears to have taken place over a protracted period with the earliest recorded broods estimated to have hatched around the end of June and the latest broods around end of July or beginning of August (Table 17).

Table 17 Youngest brood age by survey date.

Date	Lough Ree	Lough Corrib: Doorus	Lough Corrib: Oughterard –Ard
8 th July	Ib	-	-
11 th July	-	Ia	-
19 th July	-	Ic	Ia
29 th July	IIa	-	-
2 nd Aug	-	IIc	Ia
11 th Aug	IIb	-	Ic
30 th Aug	-	-	IIa

4.4.2 Coverage

Pre-breeding survey

Coverage of Lough Corrib, Lough Ree, Lough Arrow and Loughs Conn/Cullin were considered good during both pre-breeding visits. Lough Gara had incomplete coverage due to low water levels making some parts of the lake inaccessible. This inaccessible area was considered, by the surveyors, to be unsuitable for Common Scoters.

Brood survey

Coverage was good during the brood surveys at all sites. Generally low winds and dry conditions meant that there was good visibility on the lakes and the results are considered accurate.

4.4.3 Survey constraints

Pre-breeding survey

The weather was excellent during this period and is not considered a constraint.

Brood survey

Weather was good throughout the brood survey period. The main constraint was the difficulty in detecting young scoter ducklings which remain still and camouflage well with black stones and mosses on the lake edge. Young ducklings were particularly hard to find even in perfect conditions. On one occasion during a partial survey of the Doorus Peninsula on the 16th of July young ducklings (estimated at class Ib) recorded in a small area on both the 11th and 19th July could not be found. It may be that these birds had moved to another location but this explanation seems unlikely given their age and it is likely they were missed in the survey due to difficulties in detection.

4.4.4 Effect of scoter movements on survey accuracy

Pre-breeding survey

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 discussed by Gittings (1995) and in 1996 and 2012 the same area at Oughterard was re-surveyed to reduce double counting error (Delany & Gittings 1996, Hunt *et al.*, 2012).

In 2012 double counting was a concern due to the high numbers of scoter in the Oughterard area of Lough Corrib. To reduce this error the reed bed area of Oughterard Bay was counted from shore by another team of surveyors (NPWS rangers Eugene Finnerty and Evelyn Joyce). Surveys were carried out at five different time slots on May 15th at the same time as the pre-breeding survey was underway. These counts provided some indication of turnover within this part of the bay and satisfactorily addressed the potential double counts.

To reduce the potential for double counting in future surveys an option may be to survey the entire Lough in a single day with multiple surveyors. Three boats covering the key areas of Lough Corrib: the “Fugis” – Ard, Ard – Oughterard and Doorus would be of benefit. The use of shore based watches along with boat surveys in the Oughterard area worked well in terms of understanding Common Scoter turnover in this part of the lake. Consistency in observer and boat operator covering sections of the lake may serve to increase knowledge and understanding of parts of the lake.

Key to detection is the boat operator/second observer. Boat operators with a keen knowledge of the lake and knowledge and interest of its birdlife will ensure that all parts of the lake are visited. On Lough Corrib the boat operators were considered to be exceptional, rowing the boat and even dragging the boat over shallows to ensure coverage of likely scoter nest areas.

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. Crèches were noted on both Lough Corrib and Lough Ree during this survey

4.4.5 Plumage, bill morphology and identification notes

There was much discussion regarding the identification of birds observed in Lough Corrib during July 2020. These birds exhibited family-like behaviour and were noted in areas where pre-breeding birds

had been recorded. This coupled with observations of paired scoters in mid to late April and a record of a suspected scoter nest in May lead to speculation about the age of these birds. Observations of these groups of female Common Scoter revealed that two of them had a male type bill owing to a prominent knob, which lead to greater uncertainty.

Photographs were taken and international experts were consulted (see acknowledgments). The general consensus was that these were not juvenile scoter but adult females. This conclusion was reached on the basis of the following:

The distinguishing features gleaned from several opinions and summarised as follows. Birds were firstly identified as adult birds not juveniles on the basis that adult females have pale fringes to the feathers whereas juveniles are more plain coloured without pale tips (Figure 14 & 15). At very close range on juveniles faintly paler tips to the very neat wing coverts and secondaries can be seen, but they are essentially uniform and dark above the waterline. Photographs taken during the 2020 scoter survey show a dark belly in these birds another key indicator that the individuals were adults. First year birds have a distinctly paler belly, visible in flight or when they sit up in the water to wing-flap.

Several of the experts noted that the bill knob is also known from females and is not an exclusive feature of males. In fact these knobs on females, while normally absent, can apparently be quite large. The male scoter acquires black plumage in their first year and are essentially adult male-like (but with faded brown wings and a pale belly) before they are even one year old. Also, the 'knob' shaped bill develops later than the black plumage. Adult male Common Scoters remain generally black even in their eclipse plumage.

The family behaviour observed ostensibly is typical of these ducks which stay within close female family groups at all times of the year. In Scotland on Loch Loyne following breeding failure the birds often behave as a very tight flock, sticking closely together, diving and moving around in synchrony. They also are often noted as stressed and flighty at these times and leave shortly afterwards.

In conclusion, given the timing of the observations and location of these birds they are most probably failed breeders flocking before returning to sea. The numbers observed support this theory.



Figure 14 Adult female Common scoters. Note light fringe to feathers and the bill knob. Photograph: Marie Louise Heffernan



Figure 15 Young Common Scoter ducklings class IIc on Lough Corrib (Doorus) 2nd Aug 2020. Note the homogenous dark backs. Photograph: Marie Louise Heffernan

4.5 Factors Influencing Common Scoter populations in Ireland

In the 2012 report, changes in water quality, suitability of nesting habitat, the introduction of roach, and Mink predation were all considered as factors which may influence the breeding Common Scoter in Ireland. These factors have also been considered by other authors (Gittings, 1995; Tierney, 2001). Observations of these and other factors which may be responsible for changes to, and declines in, the Irish Common Scoter population are considered below. Before looking at these factors the ecology of the sites selected by Common Scoter in Ireland is explored.

4.5.1 Lake ecology

On the island of Ireland breeding Common Scoter select large limestone lakes the smallest of which is Lough Arrow at 1240 ha and the largest is Lough Corrib upper at over 16,000 ha. All sites are situated relatively close to each other to the west of the country and within an area of 7,500 km². The Lough Corrib population is at its closest, 20 km from the sea. Loughs Conn and Cullin and Lough Arrow are both 22 km from the sea, while Lough Ree is furthest from the sea at 70 km.

The following observations were made mainly in respect of the two main scoter lakes Lough Ree and Lough Corrib which have shown successful breeding in 2020. Factors influencing distribution were considered to be: topography, habitat, water depth, shelter and distance from shore.

Scoter were noted mainly in shallow water on Lough Corrib associating particularly with wooded and wooded grazed Islands (Figure 16). An association with wooded grazed islands was found in both 2012 and 2020. These islands are grazed sufficiently to prevent scrub encroachment but not so much that the woodland fringe is lost. This combination of a tree canopy and high vegetation in the field layer may make these islands suitable for nesting. On Lough Ree likely nest sites are located on wooded islands called the Black Islands. These are lightly grazed by goats allowing enough vegetation cover for nesting birds. Further investigation with regards to nesting habitat is required.



Figure 16 Islands off Oughterard – wooded entirely and wooded grazed with a woodland belt at edge (source: Bing Maps)

It is of note that the habitat selected by breeding scoter in Ireland contrasts greatly with the habitats selected in Scotland where sites in the Flow Country tend to be small acidic peaty lakes of less than 2ha in size. In the Western Highland region nesting is on larger valley bottom lakes (c300-1300 ha) and nesting was confirmed in wet heath with a birch scrub “over storey”. Suitable nest sites in Scotland have 50% overhead cover *e.g.* willow scrub/bog myrtle. Some island sites are grass covered but also have some scrub cover. In Iceland, typical nest sites are found under low scrubby willow and the canopy is knee high. Over storey/canopy cover is considered to be a likely factor in nest site selection (Mark Hancock and Alison McLennon, RSPB pers. comm). Nest sites have yet to be found in Ireland. NPWS trialled the use of drone-mounted thermal imaging sensors 2020 to search for nesting Common Scoter on Lough Corrib. The trial did not detect any Common Scoter nests and requires more targeted proof of concept trials.

In Scotland shallow water areas within 10 m of lake shores and typically less than 0.9 m in depth, had 1.9 and 4.1 times more foraging use than expected by chance (Hancock *et al.*, 2019). The 2020 observations suggest a similar pattern of foraging in shallow waters at lakes in Ireland and a similar link to invertebrate abundance would be expected. As in 2012, food resources are likely to be a key factor in scoter breeding success. There is a need for further data on the feeding requirements of Common Scoter at existing breeding sites. This is likely to be critical as part of the further conservation management of the existing breeding population and may help to explain national population declines and dramatic lake level declines since the 1990’s.

In general, on Lough Corrib adult Common Scoter were not recorded near reed-beds with the exception of Oughterard bay. The southern basin of Corrib has many reed-beds and no scoter records. Ducklings in contrast were often seen associating with reed-beds (Figure 17). It was noted that the key areas for successful scoter breeding on Lough Corrib: Doorus and Oughterard-Ard were very similar in appearance. The water was shallow in these areas and reed-beds were present. Both areas had islands located relatively close to a south west shoreline and thus in the shelter from the prevailing wind.

On Lough Corrib the islands in the Oughterard area are generally within 2 km of the shore. The islands around Ard are further from the mainland with most breeding scoter recorded close to Illaunfadda More (‘the long island’) which is 800 m from shore. In the Oughterard-Ard area no island is more than 1 km from another. At Lough Ree the Black Islands are around 800 m from the shore so the pattern of Island selection is similar.



Figure 17 Reed bed at Doorus frequented by ducklings, July 2020. Photograph: Marie Louise Heffernan



Figure 18 Islands of Doorus northern Lough Corrib. Photograph: Marie Louise Heffernan

As in Scotland, scoter were mainly observed on shallow water (Hancock, 2015). They were notably absent in Lough Corrib from areas of deep water such as Maum and the western side of Doorus to Cornamona. They also appeared to be associated with rocky substrate and absent from areas with silty clay substrate such as at the southern basin and the Narrows (narrow middle section of Lough Corrib). Much of upper Corrib is infested with zebra mussels which grow in abundance on the rocky substrate and there may well be a relationship with these factors and scoter distribution which would require additional investigation. Zebra Mussels are also present on Lough Ree and on Loughs Conn and Cullin.

4.5.2 Predation

Different predators may affect Common Scoter at different stages of breeding. Nesting females may be predated by Mink or other mammals. This has been considered as an explanation for a skewed male to female ratio at breeding sites (e.g. Partridge & Smith, 1988). Hooded crows, Mink, Fox and Otter are known predators of ground-nesting birds, both incubating adults and eggs. Otter was noted during the survey of Lough Corrib and Mink were sighted just after the brood survey was completed. Both Mink and Otter are primarily nocturnal and would not be expected to be active outside daylight hours, and thus less likely to be recorded during surveys. Nests on or near the shoreline may also be at risk from Fox, Rat (*Rattus norvegicus*), Stoat and cat predation. Traylor *et al.* (2004) showed that White-winged Scoter (*Melanitta deglandi*) selected nest sites on islands where success is greater than on the mainland due to lower predation risk. Ducklings may be predated by corvids, Mink, large Pike, gulls (*Larus* spp.) and Grey Heron. Predation is likely to be one of the key factors which determine breeding success and productivity in the Irish Common Scoter breeding population; however, more evidence is required in this regard.



Figure 19 Young duckling class Ia with female, Oughterard. Note typical island in the background. This island was host to a heron colony. Photograph: Marie Louise Heffernan

On Lough Corrib the number of Hooded Crows observations during pre-breeding surveys was notable (62 observations) and may contribute to poor breeding success at this site. Hooded Crows nest on islands and the mainland shore of Lough Corrib and are likely to be attracted to islands by picnicking remains. Although corvid control was in operation to the north and east of the upper Lough they were not located in the main scoter breeding areas. While predator control is carried out by both BWI and NPWS on Lough Corrib, coverage may not currently overlap either temporally or spatially with breeding Common Scoter.

Predator control on Lough Ree may be making a difference in terms of breeding success and productivity at this site. Unlike Lough Corrib, no Hooded Crows were recorded as potential predators during the surveys on Lough Ree. Lesser Black-backed Gulls were considered to be a threat to Common

Scoter ducklings at Lough Ree. Donehower & Bird (2008) noted that despite high nest success (>80%) of eider at Stratton Island few ducklings made it to fledge due to gull predation.

The distance between nest sites and shore is likely to influence predation risk. Nesting on islands reduces the opportunity for predation by some species (Fox, Rat, and Stoat). However, Mink can swim long distances (Roy *et al.*, 2009) allowing them to predate scoter even on islands.

It is worth noting that in May the lake supported other breeding birds (*e.g.* Red-breasted Merganser *Mergus serrator* and Tufted Duck *Aythya fuligula*) with many hatching broods in June. Common Scoter are relatively late breeders with young still being hatched into August. On Lough Corrib there were few other birds present at this time and it is therefore possible that scoter ducklings may suffer an increased predation risk as a result of lower numbers of other prey available to predators. NPWS staff from Lough Ree made a similar observation in relation to the threat of predation of scoter by Lesser Black-backed Gulls.

To positively impact breeding success, any predator control measures must be targeted and of sufficient intensity. In Scotland the breeding Common Scoter are widely dispersed on small lakes. In Ireland we have a significant advantage in relation to predator control as 98% of our potential breeding population is concentrated on just three lakes. Lough Ree has a comprehensive predator control programme and the relative success of the broods on this lake appears to support the continuation of this control and replication at the other lakes. It is well established that predator control can increase breeding success (*e.g.* Hunt & Heffernan 2007, Pearse & Ratti 2010). Pearse & Ratti (2010) noted that predator removal increased duckling survival by removing predators, with a 30-day duckling survival of 0.573 on predator-removal sites compared to 0.357 on control sites was reported.

5.4.3 Disturbance

Disturbance was not noted on Lough Conn or Lough Arrow. However, it was considered to be a factor on Lough Ree with disturbance noted around the Black Islands from boats and anglers. In the pre-breeding survey Common Scoter did not react to approaching boats on Lough Corrib. Common Scoter did not take flight easily unlike Mallard (*Anas platyrhynchos*) and Tufted Duck. This may be because scoter are not normally quarry species in winter. Anecdotal observations indicated that birds would only take flight at 50 m whereas other ducks were on the wing at 150 m.

In contrast during the brood survey scoter reacted to boats at a considerable distance. On a number of occasions, the parent was observed moving her brood away from the approaching boat at a distance of c. 500 m. On another occasion the parent deserted a crèche at around 70 m and on a further occasion six class II birds were split into three groups to avoid approaching boats.

Activities associated with disturbance followed a different pattern than usual in 2020. Normally there are a lot of boats on the lake in May but due to Covid 19 restrictions many anglers, in particular from the UK, could not travel to Ireland and so numbers on the lake appeared to be down. From June 8th travel was permitted within a person's county or up to 20 km from their home and on Monday, June 29th domestic travel restrictions were lifted. It appeared that there was more recreational use of the lakes than in previous years as people sought to make the most of the easing of restrictions. Common Scoter may habituate to islands regularly used by anglers or other lakes users. However they may avoid disturbed sites with implications for nest site availability.

Although no breeding studies on disturbance have been published for Common Scoter, the allied Velvet Scoter *Melanitta fusca*, has been studied in relation to recreational boat disturbance (Mikola *et al.*, 1994). The authors found that recreational boat activity had negative effects on the amount of time broods fed, and that broods were forced to swim for longer periods. Predation resulted in a 56% loss of ducklings and was 3.5 times greater in the disturbed versus undisturbed treatments. The authors suggested that brood mortality, caused by predation from Herring Gulls *Larus argentatus* and Great Black-backed Gulls, was facilitated by disturbance. These findings may be relevant with regards to any future disturbance impact assessment and methodologies, particularly for Lough Corrib and Lough Ree.

4.5.3 Other factors

Of note was mechanisation on the islands with use of tractors and quads to manage grasslands. This may have implications for scoter nesting habitat. More information on scoter nesting habitat is required to establish if this is having an impact. An investigation of land change on the islands is recommended.

Greylag Geese (*Anser anser*) numbers on Lough Corrib have increased since 2012 and they are probably the most successful breeders on the lake. Flocks of up to 70+ geese were seen regularly throughout the lake and they were often present grazing and potentially nesting on islands used by Common Scoter. Around the year 2000, feral Greylag Geese (c. 20) were released in Lough Corrib as a quarry species by a local gun club. The resident Greylag Goose population in Ireland has descended from released birds, mainly in the 20th century (Boland and Crowe, 2008). Numbers of resident feral Greylag geese have increased between 2011/12 and 2105/16 and the population now stands at over 2,800 individuals an increase of at least 1,300 birds since 2008 (Lewis *et al*, 2019).

5. Conclusions and recommendations

The 2020 Common Scoter survey recorded a potential breeding population of 50 pairs, an increase from 39 pairs in 2012. This may indicate a positive upward trend in a population that has suffered dramatic declines since 1995 (100 pairs). However, with only two surveys in 20 years, further data is required. The 2020 data on overall breeding success and productivity is comparable to 2012, with similar differences between Lough Corrib and Lough Ree. Further data is required to understand the population trends and in particular to estimate the number of fledged young required to at least maintain a stable population. This data is available for the small scoter population breeding in Scotland, however it is not available for Ireland. Data derived from the Scottish population is not considered comparable given a slight difference in brood survey approach and considerable differences in nest sites (large acidic or small peaty lakes in Scotland compared to limestone lakes in Ireland).

The factors influencing the Irish Common Scoter population have been discussed in this and previous reports (Hunt *et al.*, 2012, Gitting *et al.*, 1995). The discussion in this report has focused largely on lake ecology, predation and disturbance. These factors were observed during field surveys, however the primary focus of these surveys was detecting Common Scoter. While an informed discussion on these factors can be presented, their influence on the population can be no more than speculative.

Much remains unknown about the Irish population of Common Scoter, which lies at the edge of the species' breeding range. Although the population trend in Ireland and UK has been similar, it is not known if these birds share a common wintering ground or what drives and/or facilitates their contrasting breeding site selection. The scoters in Ireland select limestone lakes for breeding despite a preponderance of small peat lakes which are selected by Common Scoter in north-west Scotland. Research in Scotland has looked at Common Scoter prey, prey availability, water depths and interspecies competition for prey. In Ireland there has been no research on this species since the late 1990's. Since then there has been a dramatic decline and distribution change in the Common Scoter population and significant changes in the ecology of their breeding lakes. It is imperative that the gap in data and knowledge is addressed.

Increasing our knowledge of the Irish Common Scoter population can inform effective conservation management actions which are needed to secure its future. The following actions are recommended:

- Continuation and regular review of predator control on Lough Ree
- Predator control programme to be developed for Lough Corrib, Lough Arrow and Loughs Conn and Cullin, targeted at likely Common Scoter nest and brood areas and during periods of nesting, incubation, new chick stage and duckling stage.
- Establish regular Common Scoter monitoring at Lough Ree and Lough Corrib. Monitoring to include land-based watches from vantage points at Doorus, Oughterard and Ard point on Lough Corrib and from a vantage point on the Black Islands on Lough Ree. Monitoring to take place during the pre-breeding, incubation, hatching and brood periods to gather as much data as possible on breeding biology, habitat and pressures.
- Investigate likely pressures on the Irish Common Scoter population (*e.g.* via working groups and links to work in Scotland and Iceland) and identify and prioritise research actions.
- Collaborate with international partners with a view to comparing Irish data to other countries and to gaining knowledge of successful management and research actions which may be applied in the Irish context.
- Investigate the impact of feral Greylag Geese on Common Scoter and any influence their expansion may be having on nest selection or breeding success.
- Investigate the impact of Curly Pondweed and associated control methods on Scoter foraging habitat.

- Undertake research to establish the difference in prey availability between sites previously occupied by Scoter and their present range.
- A national population survey is recommended every five years with land observations in the intervening years.
- Liaison between NPWS and Inland Fisheries Ireland is particularly relevant in the context of invasive species (roach and curly pondweed), Pike and water quality. Continued liaison between NPWS and ESB is important with regards to the control of water levels on the Shannon during the bird nesting season.
- Develop and implement an integrated and holistic management plan for the lakes where Common Scoter breed. Such a plan should include all relevant stakeholders and priorities.
- Establish a Common Scoter project and project officer to action recommendations and to work with other state bodies, NGOS (non-governmental organisations) and local interests (*e.g.* angling clubs).

Targeted actions will be required for the conservation of the Common Scoter breeding population. However, it is unlikely these actions will be sustainable unless a holistic, lake-based conservation approach is adopted. While the 2020 survey results offer a small reprieve from the 50% decline reported between 1995 and 2012, we remain ill equipped to identify what measures are required should the population decline. Without action, the future of the Common Scoter population in Ireland will remain precarious.

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Appendix 1 Survey dates and coverage

Table A1 Coverage of sites, with visit number, pre-breeding survey date and boat usage in 2020.

Survey site	Visit number	Date	No. of boats
Lough Corrib	1	May 8 th	1 boat
"	1	May 9 th	2 boats
"	1	May 11 th	2 boats
"	1	May 12 th	1 boat
"	2	May 15 th	2 boats
"	2	May 16 th	2 boats
"	2	May 19 th	1 boat
"	2	May 20 th	1 boat
Lough Ree	1	May 8 th	1 boat
"	1	May 9 th	1 boat
"	1	May 12 th	1 boat
"	2	May 19 th	1 boat
"	2	May 20 th	1 boat
"	2	May 21 st	1 boat
Loughs Conn/Cullin	1	May 12 th	1 boat
"	1	May 14 th	1 boat
"	2	May 20 th	1 boat
"	2	May 21 st	1 boat
Lough Arrow	1	May 12 th	1 boat
"	2	May 20 th	1 boat
Lough Gara	1	May 8 th	shore
"	1	May 9 th	1 boat
"	2	May 21 st	1 boat

Table A2 Dates of the Common Scoter brood survey, 2020

Survey site	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
Lough Corrib	July 11 th	July 19 th	Aug 2 nd	Aug 17 th	Aug 30 th
Lough Ree	July 8 th	July 29 th	Aug 11 th	--	--
Lough Arrow	July 8 th	July 21 st	Aug 12 th	--	--
Lough Conn/Cullin	July 1 st & 2 nd	July 20 th & 21 st	Aug 11 th & 12 th	--	--

Appendix 2 Survey instructions for the pre-breeding survey.

INTRODUCTION

The aim of the 2020 survey is to complete a re-survey of five breeding sites for Common Scoter during the optimal survey period, 1st to 21st or preferably 7th to 21st May. The 2020 survey will use the methods used in 2012 (Hunt *et al*, 2012) which followed those documented by Gittings, 1995 and Tierney, 2001, for consistency in survey results. The breeding sites are as follows: Lough Corrib, Lough Ree and Lough Gara. In addition Loughs Conn and Cullin and Lough Arrow will be surveyed by NPWS.

The survey is planned to begin on May 7th. All sites will be visited once between May c. 7th and 14th and once between May c. 14th and 21st. The actual days will be dependent on the weather, but for sites requiring more than one survey day, surveys should be completed over consecutive days where possible. There should be five days between Visit 1 and Visit 2.

The following outlines the survey methods which we all need to follow. It is important that we all follow the same survey approach and recording method, for consistency in survey results.

Please get in touch with any queries before or during the survey. If there is anything which is not working out, anything that can be improved, please let everyone know and we can agree on what to do.

SURVEY PREPARATION

1. Contact the **NPWS Ranger** (see below) for your site to let them know when you plan to survey.

Priority Site	NPWS contact
Lough Corrib	Eugene Finnerty - Eugene.Finnerty@chg.gov.ie
Lough Ree	Laura Gallagher (Roscommon side; Laura.Gallagher@chg.gov.ie), Sue Moles (Longford; Susan.Moles@chg.gov.ie), Therese Kelly (Westmeath; Therese.Kelly@chg.gov.ie)
Lough Gara	Eoin Connolly (Roscommon side;) and David McDonagh (Sligo side; David.McDonagh@chg.gov.ie)

2. **Check JNCC website** for locations of breeding tern and gull colonies <http://jncc.defra.gov.uk/SMP/>. While the priority is Common Scoter locations, we will be recording gull and tern colonies, so it will be useful to get an idea of species, numbers and locations from the Seabird 2000 data, which is on this website. Also see Eoin McGreal paper on gull colony locations and latest IWM 114 on breeding seabirds (included as background info).

3. **Check Gittings Report, 1995:** Results of the 1995 Common Scoter survey. This report has the route which they took around the core lakes for the 1995 survey and provides some useful information on the priority sites and on the logistics of surveying the non priority sites (included as background).

4. **Field maps** – these will be sent in digital form.

5. **Recording forms** – a standard recording forms is attached below. Please use this form during the survey (or ensure that all details in the form are recorded during the survey and can be transferred onto this form).

6. **Essential gear required:** Life jacket, Mobile phone, GPS , Bins, Weather writer if possible.

7. **Weather** – check forecast. Surveys should not be undertaken in winds of force 4 or greater unless there is no other option.

8. **Set up GPS** – Set up details on the sheet below. While the GPS will be really useful it is important that we have some back up in case of difficulties, so all locations of Common Scoter should be mapped in the field onto the field map as well as recording the GPS grid reference. Also mark your boat route around the lake as you go, in case there is any problem with the track log set up.

9. **Some information which may be of use gleaned from Gittings (1995) and Tierney (2001):** Not possible to age female scoter unless we see its underbelly, where the juvenile feathers may be seen. Preferred nesting habitat of nesting Common Scoter is grazed islands, either wholly or in part. They need tall herbage for nesting cover, so islands with dense cover do not allow growth of herbage layer.

10. **COVID 19 guidance**

Please See the HSE website and follow their guidance (www.HSE.ie). We recommend the following during this survey:

- Maintain social distancing while working. Practically this means limiting contact with your boatman to the minimum and sitting either end of the boat
- Follow correct etiquette if sneezing or coughing. This means cough away from your boatman and into the crook of your elbow.
- Regular hand sanitising. It is recommended to sanitise before/after eating and after any coughing or sneezing.

SURVEY METHOD

COMMON SCOTER

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 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

While studies to date have not linked Common Scoter 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.

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		

GENERAL DATA

Record for every survey day. Please use categories listed:

- Time at start and end of survey.
- Date
- Wind: **calm (Bft force 0-2), light (force 2-3), breezy (force 3-4), strong (force 5+)** (note direction and force)
- Cloud cover: **0-33%; 34-66%, 67-100%**
- Rain: **none, showers, drizzle, heavy**
- Visibility: **good (to 10km), moderate (1 to 5km) poor (<1km)**
- Water surface: **calm, slightly choppy (wavelets), choppy (waves), very choppy (white caps)**

ANCILLARY DATA – to be recorded where possible and not to detriment of main survey focus**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 (eg 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

PREDATORS:

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

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 / number of Apparently Occupied Site (AOS) / pairs or presence/absence of colony.

Likely other waterbirds:

Great crested Grebe GG	Tufted Duck TU	Lapwing L.	Black head Gull BH
Cormorant CA	Goldeneye GN	Curlew CU	Common Gull CM
Grey Heron H.	Red B Merganser RM	Whimbrel WM	LB Gull LB
Mute Swan MS	Oystercatcher OC	Redshank RK	GB Gull GB
Teal T.	Golden Plover GP	Common Sand CS	Arctic tern AE
Mallard MA	Ringed Plover RP	Med Gull MU	Common tern CN
Moorhen MH	Coot CO	Gadwall GA	Canada Goose CG

KEY FIELD DATA

WEATHER
Wind: calm (Bft force 0-2), light (force 2-3), breezy (force 3-4), strong (force 5+) (note direction and force) Cloud cover: 0-33%; 34-66%, 67-100% Rain: none, showers, drizzle, heavy
Visibility: good (to 10km), moderate (1 to 5km) poor (<1km)
Water surface: calm, slightly choppy (wavelets), choppy (waves), very choppy (white caps)

Category	Description - COMMON SCOTER
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

Category	Description - HABITAT ASSOCIATED WITH SCOTER ACTIVITY	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		

DISTURBANCE – please note.

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

Ancillary data – please note other waterbirds where possible			
Great crested Grebe GG	Tufted Duck TU	Lapwing L.	Black head Gull BH
Cormorant CA	Goldeneye GN	Curlew CU	Common Gull CM
Grey Heron H.	Red B Merganser RM	Whimbrel WM	LB Gull LB
Mute Swan MS	Oystercatcher OC	Redshank RK	GB Gull GB
Teal T.	Golden Plover GP	Common Sand CS	Arctic tern AE
Mallard MA	Ringed Plover RP	Med Gull MU	Common tern CN
Moorhen MH	Coot CO	Gadwall GA	Canada Goose CG

BTO Breeding Status Codes

Non-breeding

F Flying over

M Species observed but suspected to be still on Migration

U Species observed but suspected to be sUmmering non-breeder

Possible breeder

H Species observed in breeding season in suitable nesting Habitat

S Singing male present (or breeding calls heard) in breeding season in suitable breeding habitat

Probable breeding

P Pair observed in suitable nesting habitat in breeding season

T Permanent Territory presumed through registration of territorial behaviour (song etc) on at least two different days a week or more part at the same place or many individuals on one day

D Courtship and Display (judged to be in or near potential breeding habitat; be cautious with wildfowl)

N Visiting probable Nest site

A Agitated behaviour or anxiety calls from adults, suggesting probable presence of nest or young nearby

I Brood patch on adult examined in the hand, suggesting Incubation

B Nest Building or excavating nest-hole

Confirmed breeding

DD Distraction-Display or injury feigning

UN Used Nest or eggshells found (occupied or laid within period of survey)

FL Recently FLedged young (nidicolous species) or downy young (nidifugous species). Careful consideration should be given to the likely provenance of any fledged juvenile capable of significant geographical movement. Evidence of dependency on adults (*e.g.* feeding) is helpful. Be cautious, even if the record comes from suitable habitat.

ON Adults entering or leaving nest-site in circumstances indicating Occupied Nest (including high nests or nest holes, the contents of which can not be seem) or adults seen incubating

FF Adult carrying Faecal sac or Food for young

NE Nest containing Eggs

NY Nest with Young seen or heard

SETTING UP GPS

1. TRACK MENU

Put **TRACKLOG** to ON

WRAP when full – check this is on ON

Record method – set to **TIME**

Interval – choose 1 min **INTERVAL**

2. Units

Set to **METRIC**

3. Position format

Set to **Irish National Grid IG**

4. Heading

Set to **TRUE**

4. End of DAY

SAVE current track onto the GPS at the **end of each field day**

UPLOAD GPS data onto computer – if you put map source onto your computer it is very simple to do this – you just connect the GPS to the computer, check receive data and all the track positions from the day can be saved in mapsource.

Appendix 3 Brood survey instructions.

1.0 Background

The Common Scoter is on the Red List of Birds of Conservation Concern and is one of Ireland's most threatened birds mainly because it is a rare and declining breed species. The all-Ireland population is in decline from a peak in of 180 pairs in the 1960's to 80 pairs in 1999 (Tierney, 2000) and 39 pairs in 2012 (Hunt *et al.* 2012).

Results from the 2020 survey indicate that the all-Ireland population of breeding Common Scoter is confined to 4 sites: Lough Corrib, Lough Ree, Lough Arrow and Lough Conn/Cullin. These lakes will be surveyed to determine productivity.

Brood surveys will provide information on breeding success and productivity of pairs. At least three brood surveys will be completed at each site that held breeding pairs during the pre-breeding survey. However, where relevant, up to four brood surveys may be required at a given site; for example, to follow brood/duckling survival until considered fledged or they cannot be located.

2.0 Methodology

2.1 Survey Method

The survey methodology for brood surveys will follow the pre-breeding surveys *i.e.* systematic boat survey of islands and shoreline in suitable weather conditions. Note in particular the need for suitable weather conditions and the potential for double counting.

2.2 Survey Approach

Brood survey coverage will focus on the following in order of priority:

1. Those areas of the lake where Common Scoter were recorded during the 2020 pre-breeding survey.
2. Any additional areas of the lake where Common Scoter were recorded in 2012* but not in 2020**.

***Note:** See Appendix III attached (and Irish Wildlife Manual No. 66) for maps of Scoter locations as recorded in 2012.

****Note:** Brood survey coverage on Lough Corrib is limited to 8 survey days and on Lough Ree to 3 survey days. The results of the first and the second brood survey visit will be discussed to ensure the most effective and useful survey approach for successive visits. NPWS staff will provide brood survey coverage for Lough Arrow and for Loughs Conn and Cullin.

2.3 Timing

Ideally, to document the earliest hatching dates, the brood surveys should commence at the beginning of July and finish late August. The survey periods for brood surveys are:

Visit 1: 1st – 15th July; Visit 2: 16th – 31st July; and Visit 3: 1st – 17th August.

A fourth visit may occur within or after the aforementioned survey periods.

All surveys visits will be separated by **at least seven days**.

For Lough Corrib and Lough Ree brood surveys will be completed by the same survey teams (field ecologist and boat operator) as those for the pre-breeding census.

2.4 Records Required

A standard recording form template for the brood survey is attached below (part of Appendix I).

Essential information to be gathered during the brood survey (key data in bold):

1. **No. of Common Scoter (male, female, immature) with or without young.**
2. **Location of each brood – please map and take a GPS reference**
3. **The number of ducklings and the age (plumage) class of each scoter in a brood.**
4. **Single brood or crèche (see Note below)**
5. Please note any additional information (activity, predators, disturbance, habitat)

Note: Common Scoter are known to crèche their broods and care must be taken to check that when encountering a female with ducklings that they are all the same age class. Two or more age classes would indicate a crèche.

When ducklings are encountered in the field they will be aged by plumage class. These classes are three in number, with seven subclasses. Knowing the ages of the brood allows individual broods to be tracked over the course of the surveys.

Gollop and Marshall (1954) (Appendix 1) provides a description of plumage classes for ducklings which can be used in the field.

References

Gollop, J.B. and W.H. Marshall. 1954. A guide for aging duck broods in the field. Mississippi Flyway Council Technical Section. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/birds/ageduck/index.htm> (Version 14NOV97).

Hancock M., 2012. Common Scoter Breeding Ecology Study, Scottish Highlands, 2009-11 . Unpublished report for the RSPB March 2012.

Hunt, J., Heffernan, M.L., McLoughlin, D., Benson, C. & Huxley, C. (2012) The breeding status of Common Scoter, *Melanitta nigra* in Ireland, 2012. *Irish Wildlife Manuals*, No. 66. NPWS Department of the Arts, Heritage and the Gaeltacht, Ireland.

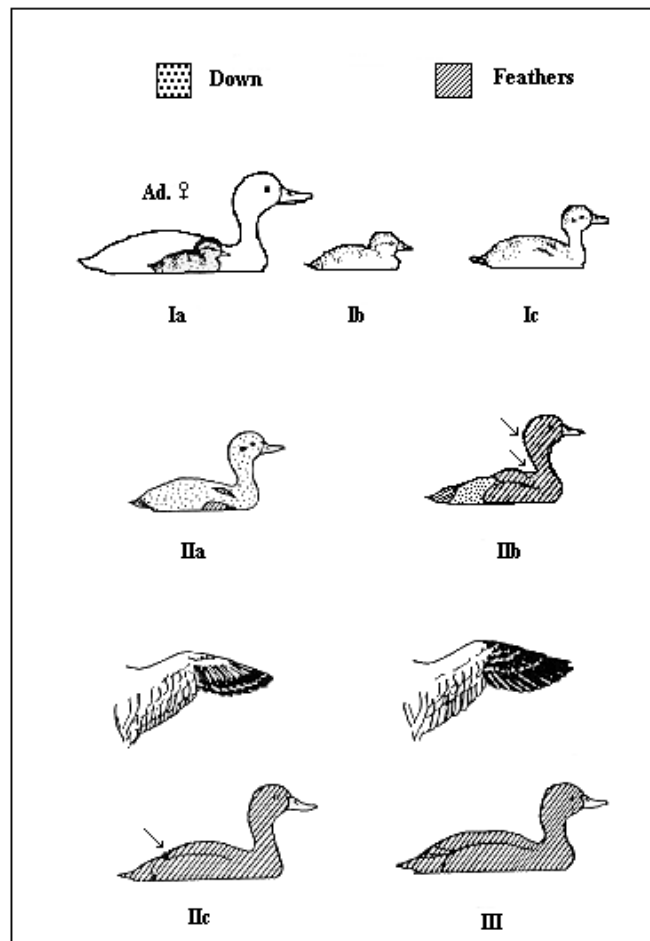
Tierney D. 2001. The Biology of the Common Scoter *Melanitta nigra* (L.) breeding in Irish Loughs – population, behavioural and feeding ecology. Unpublished PhD thesis, Department of Zoology, National University of Ireland, Galway.

Appendix I (of Brood Survey Instructions)

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

Plumage Class	Sub-Class	Description
I. Downy Young - No Feathers visible	a	" Bright ball of fluff ". Down bright. Patterns distinct (except diving ducks). Body rounded; neck and tail are not prominent.
	b	" Fading ball of fluff ". Down colour fading, patterns less distinct. Body still rounded; neck and tail are not yet prominent.
	c	" Gawky-downy ". 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	" First feathers ". 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	" Mostly feathered ". 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	" Last down ". 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		" Feathered-flightless ". No down visible. Primaries completely out of sheath but not fully developed. Stays in this class until capable of flight.

Figure I - Appearance of Young at Beginning Point of Each Plumage Subclass:



RECORDING FORM: COMMON SCOTER BROOD SURVEY 2020

Surveyor		Site/sub site	
Start		Finish	Date

Wind (km/hour) and direction		Visibility (poor/moderate/exc)	
Rain (showers/drizzle/heavy rain)		Water surface (calm/slight chop/waves)	
Cloud (% cover)			

Recording Form: (nb: Obs no. in column 1 should link to map)

Observation no.	GPS location	Time	Number of scoter (male/female/immature)	Adults with brood y/n	No. ducklings & plumage class.	Single brood or creche.	Activity (loafing/feeding/preening/alert/flight)	Habitat (distance from shore/depth of water)	Other data (disturbance, predators)

