

A survey of the Lough Mask breeding gull population

by
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November, 2006



This project was funded by the Heritage Council under the Wildlife Grant Scheme, 2006 (Wildlife Grant Ref: 14768) and by the National Parks and Wildlife Service.



SUMMARY

Between 1977 and 2000 breeding gulls suffered dramatic declines on Connaught's inland lakes. Numbers of Lesser Black-backed Gull and Black-headed Gull crashed by over 80% and numbers of Common Gull by 75%. Herring and Great Black-backed Gulls are now largely absent as a breeding species. While gulls are still nesting at all five of Connaught's inland lakes, the main breeding numbers are now concentrated on Loughs Corrib and Lough Mask.

The aim of this project was to census the breeding gull population on Lough Mask, to establish which islands were being used by nesting gulls and to gather data on breeding success. It was hoped that this project might provide some insight into the reasons for the drastic declines in gull numbers on Connaught's inland lakes.

The 2006 survey found 1200 pairs of Black-headed Gull, 282 pairs of Lesser Black-backed Gull and 410 pairs of Common Gull. Compared to 1977 the nesting gull population on Lough Mask appears to be stable. However, productivity data revealed breeding success to be moderate to poor at all but one colony. Clutch size data was comparable to that recorded in 1977 and comparison of laying and hatching dates found that laying began about a week earlier in 2006 than in 1977.

While a number of factors may be affecting breeding success on Lough Mask, those identified during this project were the weather, availability of nesting habitat and predation. Wet weather in May flooded a number of nests and despite re-laying is likely to have reduced breeding success. It is also possible that lack of grazing on some islands, allowing encroachment of scrub is reducing available nesting habitat. Predation by mink was proven at Rams Island where a mink was trapped soon after 23 dead fledglings and 3 dead adults were counted from the colony. At this site breeding success was 0.23 Lesser Black backed gull chicks per pair. The wounds to dead adult gulls at another colony also suggested mink predation.

Predation by mink can take place annually and can cause complete breeding failure. While the effects of mink predation may not be evident in the short term, continued predation will cause a decline in breeding numbers, or site abandonment. Without productivity measurements breeding failure due to mink can go undetected and the value of gathering productivity data has clearly been shown.

Lough Mask is a Special Protection Area for birds under EU Directive 79/409. It is of national importance for breeding Common Tern and for breeding Black-headed Gull, Lesser Black-backed Gull and Common Gull. Other nesting wildfowl such as Tufted Duck and Mallard add to the diversity of bird life at this site. A mink control programme is required to protect these populations of nesting birds. Such a programme should be run in conjunction with surveys of breeding numbers and breeding success to ensure the impact of mink predation and control can be properly evaluated. Given the results from the 2006 survey of Lough Mask, similar surveys of breeding numbers and breeding success should now be completed at Connaught's other inland lake sites.

ACKNOWLEDGMENTS

We would like to thank the Heritage Council and the National Parks and Wildlife Service for funding this project.

Further thanks are due to Dr Stephen Newton, Senior Conservation Officer with BirdWatch Ireland for his invaluable support throughout the project.

Much thanks is given to Sean Moogan our boat man throughout the field season. Sean also provided assistance during survey work, which was greatly appreciated.

Other valuable survey assistance was given by Andrea Northover, Heritage Student at Galway Mayo Institute of Technology (GMIT), Castlebar and Orla Prendergast, Lecturer in Outdoor Education at GMIT, Castlebar. Padraig Canny and Trish Walsh of Petersburg Outdoor Education Centre have had a long and active interest in the breeding gulls on Lough Mask and also gave valuable survey assistance.

We were grateful for support from Eoin McGreal of the National Parks and Wildlife Service, who was undertaking a gull ringing project on Lough Mask, during the 2006 nesting season

Thanks are also due to Dr Clive Craik of the Scottish Association for Marine Science for his advice in relation to mink predation.

Sean Moogan – boatman and fieldworker.



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1. INTRODUCTION

Connaught's population of inland breeding gulls is concentrated on Lough Mask, Carrowmore Lake, Loughs Conn and Cullin and Lough Carra in Co. Mayo and on Lough Corrib in County Galway.

Records of gulls breeding at these lakes exist from as early as 1900 (Usher and Warren cited in Whilde, 1978). However it was not until 1977, that a complete survey of nesting gulls on the lakes was undertaken (Whilde, 1978). Prior to this inland breeding gulls received little attention and it was only as their numbers began to increase that interest in them grew (Whilde, 1978).

The 1977 survey showed the inland lakes of Connaught held over 9,000 pairs of nesting gulls. Lough Corrib, followed by Lough Mask were the most important sites, with 5 breeding species recorded and high numbers of Lesser Black-backed gull, Black-headed Gull and Common Gull. Carrowmore Lake, Lough Conn and Lough Carra were especially important for Black-headed Gull and had smaller numbers of Common Gull (Table 1).

A re-survey of the lakes in 1993 found 5,500 pairs of gulls nesting on the inland lakes of Connaught (Table 1), a decline of 60% since 1977. At this time the declines in Great and Lesser Black-backed Gull and in Herring Gull were linked to botulism. The reason for declines in Common and Black-headed gulls were unclear. In 1999 the lakes were re-surveyed as part of Seabird 2000 (Mitchell *et al.*, 2004). This survey found that the trend of decline had continued with only 1,600 pairs now breeding on the lakes (Table 1).

Black-headed Gulls on "Annagh" Islet on Lough Mask.



Table 1: Breeding population (as individuals) on the west of Ireland lakes between 1977 and 2000 (1977 data is from Whilde *et al.* 1978; 1993 data is from Whilde *et al.* 1993; 2000 data is from SB2000 (Mitchell *et al.* 2004); except Lough Carra 2000 data which is from Chris Huxley and is for 2003. All 2000 data was derived from counts of AON (ie number of nests was doubled to give no. of individuals) to be consistent with Whilde data. However the Lough Corrib Black-headed Gull count for 2000 gave 6 AON, 256 chicks and c. 856 adults and an estimate of 850 individuals was therefore used.

Species of gull Site/Year	Great Black-backed			Lesser Black-back			Herring			Mew (Common)			Black-headed		
	1977	1993	2000	1977	1993	2000	1977	1993	2000	1977	1993	2000	1977	1993	2000
Carrowmore Lake			0			0			0	270	600	118++	1350	0	74
Lough Conn			2			20			0	70	+	80	1000	?	0
Lough Cullin			0			0			0	40	+	0	80	+	0
Lough Carra			0	0		0			0	436	72	140	3341	252	200+
Lough Mask	8	2	0	732	722	572	50	2	0	930	742	*268	850	2650	658
Lough Corrib	35	6	1	2587	389	20	611	6	8	972	696	362	4660	5284	850
TOTAL	43	8	2	3319	1111	612	661	8	8	2718	2110	968	11281	8186	1708

*This survey did not cover Long Rock where Common Gull are nesting, so this figure may be an underestimate.

In the 1993 results “?” denotes gulls not found; “+”denotes gulls present. Loughs Conn and Cullin could not be surveyed properly in this year.

Since 1977 breeding gulls have suffered dramatic declines on Connaught's inland lakes. Herring and Great Black-backed Gulls are now largely absent as a breeding species. Numbers of Lesser Black-backed Gull and Black-headed Gull have crashed by over 80% and numbers of Common Gull by 75%. While gulls are still nesting at all five of Connaught's inland lakes, the main breeding numbers are now concentrated on Loughs Corrib and Lough Mask.

The declines at Ireland's inland breeding gull colonies are described as dramatic by Mitchell *et al.* (2004) and referring to Black-headed Gulls in particular, as being of great conservation concern. Funding was granted by the Heritage Council and the National Parks and Wildlife Service to census the breeding gull population on Lough Mask and to look at productivity at selected colonies.

2. METHODS

2.1 OCCUPIED ISLANDS

Early in the breeding season all islands on Lough Mask, with any known history of nesting gulls, were visited and checked for nesting gulls. Nest counts were then made at all occupied islands (see Results section 3). Subsequent fieldwork was concentrated on Carrigeendauv, the unnamed Islet at M135665 hereinafter referred to "Annagh" Islet, Long Rock and Ram's island as these islands supported the main gull colonies on Lough Mask. All islands except Long Rock were located on the main lake of Lough Mask. Long Rock is part of the same wetland system, but lies within an inlet a little inland (see Map). Between early April and early July seven visits were made to the main lake islands and six visits were made to Long Rock. The islands on Lough Mask were visited by boat. The islands at Long Rock were not accessible by boat, and kayaks were used instead.

Preparing to paddle to Long Rock Common Gull colony



2.2 BREEDING POPULATION CENSUS

Following Walsh *et al.* (1995) whole colony counts were made by walking transects of the colonies and counting Apparently Occupied Nests (AON). Nest counts were completed in late April and early May (see Results). Generally there were two counters and a scribe. Counts were of active nests as defined by Walsh *et al.* (1995).

Nest counts were made at each colony until most of the nests were holding eggs (less than 15% empty, if possible) and this was taken as the final census figure.

Where the risk of double counting became likely we used the “pasta method” (Aspinall, 1993) where a piece of pasta is placed in each counted nest. During nest counts we recorded the number of eggs in each nest to estimate clutch size and completion of laying (ie when more than 90% of nests had three eggs).

At Annagh Islet we used ropes to section the island into manageable count units (following Walsh *et al.* 1995). However we still did not anticipate the density and number of nests on the island and had to abandon the count 4/5ths of the way through. We were concerned that we were causing prolonged disturbance and decided to extrapolate our count for the rest of the island.

At Devinish Rocks a count of Apparently Occupied Sites (AOS) was made as the gulls were nesting on a group of rocks and we could not land.

Black-headed Gull nest on Annagh Islet



2.3 STUDY SITES

Fifty nests at four different colonies were “marked” in order to track the eggs from laying to hatching and as far as possible to fledgling. Nests were marked at the Common Gull colonies on Ram’s Island and Long Rock, at the Black-headed Gull colony on Annagh Islet and at the Lesser Black-backed Gull colony on Carrigeendauv. The nests were marked at the egg laying stage using a numbered flat stone. The numbered stones were placed under or close to each nest. On subsequent visits the numbered stone was found and contents of the nest were noted. The marked nests were grouped together within the colony. For Lesser Black-backed Gulls this was a linear grouping as these gulls were nesting along the shore of the islands. The study sites were only useful until hatching began, thereafter it was not possible to track chicks to nests and the study sites were abandoned. It also became increasingly difficult to find the stones with Spring growth in vegetation.

2.4 PRODUCTIVITY

Counts of the number of fledged young were made at each colony. The timing of these counts was based on hatching dates and the time taken for each species to fledge. At approximately the middle of the fledgling period visits to the colonies were made and the number of fledged (ie flying) or nearly fledged young were made.

As we walked the islands the fledglings moved to the water and we were able to count discreet groups of young on the water quite easily. While these counts will provide only crude data, this method is similar to that described by Craik (1998) and as we were not dealing with very large colonies counting accuracy was considered to be good.

2.5 GENERAL OBSERVATION

Observations regarding anything of interest, such as gull diet, the effects of flooding and evidence of predation were noted and are recorded in Appendix 1. General habitat notes on each of the islands visited are provided in Appendix 1 and 2. A photographic record of the fieldwork is shown in Appendix 3.

Recording of the Black-headed Gull colony with digital camera.



3. RESULTS

3.1 BREEDING POPULATION

In 2006 1,868 nesting gulls (pairs) were recorded on Lough Mask, these were 1200 Black-headed Gull (pairs), 410 Common Gull and 282 Lesser Black-back Gull (Table 3). While six islands were occupied by nesting gulls (Table 2), the main colonies were located on Carrigeendauv, Annagh Islet, Long Rock and Ram's Island, with only small numbers at Gravel Island and Devinish Rocks. Three colonies were mixed species, the rest were single species (Table 3). At Annagh Islet 36 Common Tern nests were also counted.

Table 3: The islands which were occupied by nesting gulls in 2006.

Island name	Grid Ref.	Species of Gull
Carrigeendauv	M125 685	Lesser Black-backed Gull
Annagh Islet	M135 665	Black-headed Gull, [Common Tern]
Long Rock	M134 596	Common Gull, Lesser Black-backed Gull
Devinish Rocks	M117 647	Common Gull
Gravel Island	M093 609	Common Gull, Lesser Black-backed Gull
Ram's Island	M091 598	Common Gull, Lesser Black-backed Gull

Table 3. Numbers of Apparently Occupied Nests (AON), mean clutch size, number of fledged chicks and fledgling success at each of the gull colonies on Lough Mask. Data is unadjusted to take account of nest loss due to flooding and fledgling gains due to re-laying. Number of Apparently Occupied Sites (AOS) only was recorded at Devinish Rocks as landing was not possible. Nd = not determined.

Gull species	Island	AON	Clutch Size (mean)	No. Fledged	Fledgling Success
Black-headed Gull	Annagh Islet	1200	2.76	844	0.7
	Total	1200	2.76	844	0.7
Lesser Black - backed Gull	Carrigeendauv	143	2.86	165	1.15
	Ram's Island	89	2.19	21	0.23
	Long Rock (main island)	6	nd	nd	nd
	Gravel Island	44	1.77	5	0.11
	Total/peak mean*	282	2.27*	191	0.67
Common Gull	Ram's Island	141	2.5	57	0.4
	Long Rock (main colony)	164	2.8	145	0.88
	Long Rock (small colony)	46	2.26	0	0
	Gravel Island	44	1.77	5	0.11
	Devinish Rocks	15 AOS	nd	nd	nd
	Total/peak mean*	410	2.33*	207	0.5
[Common Tern]	Annagh Islet	36	nd	nd	nd

3.2 SPECIES ACCOUNTS

3.2.1 Black-Headed Gull

The Lough Mask population of Black-headed gulls was located at one colony, Annagh Islet. Annagh Islet is mainly shingle with a few dead trees. Over the Spring dense clumps of grass and nettles covered the island. Annagh Islet is one of the smallest islands with a large gull colony on Lough Mask. The nests were densely packed and covered the whole island.

On 27th April 939 AON's were counted from an estimated 4/5ths of the colony (Appendix 1). By extrapolating this figure it was estimated that **1200 AON** were on

the Islet (see 2.2). Using data from the number of actual nests counted, less than 2% were empty and 62% had three eggs (n = 939)..

Black headed Gull colony, Annagh Islet, Lough Mask



Based on study site data, by 7th May 84% of nests had three eggs indicating that laying was almost complete (n=50). **Mean clutch size was 2.76**. By 16th May hatching had begun at this colony with 1-3 day old chicks recorded. By 24th May heavy rainfall had raised lake levels by approximately 1 metre and flooded parts of the island. An estimated 200 nests were flooded, but most of the island was unaffected and chicks were continuing to hatch. Hatching and chick rearing continued into June and by 26th June only dead fledglings were counted on the Islet and **844 fledged young** were counted on the water.

Based on an initial breeding population of 1200 Black-headed Gulls and 844 fledglings, productivity is estimated at **0.7 chicks fledged per pair**. Taking account of 200 nests lost due to flooding productivity is estimated at **0.84 chicks fledged per pair** (This figure does not take account of any possible re-laying).

Table 4a: Laying (estimated), hatching and fledgling dates for Black-headed Gulls on Lough Mask based on 2006 fieldwork.

Black-headed Gull	Start of Laying (estimate)	Completion of Laying	Hatching	Fledging
Annagh Islet	20 th April	7 th May (84% of nests 3 eggs)	16 th May (1-3 day old chicks)	26 th June

3.2.2 Lesser Black-Backed Gull

Lesser Black-backed Gull colonies were located at Carrigeendauv, Ram’s Island and Gravel Island, with a few pairs also at Long Rock. Apart from Carrigeendauv which supported only Lesser Black-backed Gulls, the other islands supported mixed colonies of Lesser Black-backed Gull and Common Gull. Carrigeendauv supported the largest Lesser Black-backed Gull colony, followed by Rams’ Island, Gravel Island and Long Rock. The numbers breeding at Long Rock were 6 or less and a separate account of this colony is not considered further.

CARRIGEENDAUV

Lesser Black-backed Gull nests were found on all shores of this island, but most were located on the west shore. The interior of the island was dominated by dense trees and scrub. Nests were only found in the island interior at the south tip where the vegetation was a little more open. Nests were located between and under rocks, under trees and on top of rocks. During the summer the vegetation became dense with very tall grasses and reeds especially along the west shore.

A whole colony count made on the 7th May gave **143 AON's**. At this time 16% of nests were empty and 60% had clutches of 3 eggs. On 16th May a count of the study site only found 91% of nests with 3 eggs and 1 empty nest (n=37). **Mean clutch size was 2.86.**

By 24th May the first chicks had hatched and these were estimated to be 1-3 days old. Heavy rainfall (see 3.2.1) meant that the shoreline could not be walked and no further data was collected on this date. It was estimated that 1/3 of nests may have been lost. Flooding seemed to be worse on the west shore as the land is particularly low lying.

By 6th June re-laying was underway. More chicks were recorded as were many failed nests due to the flooding. Only new chicks were recorded in the nests, the larger chicks were hiding and hard to find. On 11th July **165 fledged young** were counted all on the water or in the air. On the island only 2 chicks and 2 eggs were counted.

Based on a breeding population of 143 pairs at this island, productivity was **1.15 chicks fledged per pair**. Taking account of an approximately 45 nests lost in the flood productivity is estimated at **1.68 chicks fledged per pair**. (This figure does not take account of any possible success after re-laying).

West shore of Carrigeendauv, post flood.

RAM'S ISLAND

This is the largest island, with nesting gulls on Lough Mask. It is the only grazed island. The interior is a grassy hill and the shore is vegetated rock, with patches of scrub and shingle. The Lesser Black-backed gull colony was mainly located along the western shore though some nests were also found on the north tip and on the eastern shore. The nests were spaced apart, placed under trees, in tussocks, next to boulders and pieces of wood.

On 7th May **89 AON's** were counted on the Ram's Island. 63% of nests had three eggs and 16% were empty. **Mean clutch size was 2.19** (using whole colony data where n = 89). A nest count was not made on the 16th May due to poor weather.

On 24th May the first hatching was recorded and seemed to have just begun with only a few new chicks (1-3 day old). There was a lot of chipping and lots of eggs still to hatch. While the effects of flooding were evident at the other islands on this visit there was no sign of any nest lost due to flooding at this colony.

In early June the large chicks were hard to find, but by 26th June fledged young could be counted on the water. Only **21 fledglings** were counted (all on the water) and 23 dead fledglings and three dead adults were counted along the shore. The dead young were wounded at the back of the neck suggesting mink predation. Some of the young had been torn apart. A mink was caught on the island on the 11th July.

Mauled Lesser Black-backed fledgling on Rams Island



Based on a breeding population of 89 pairs at this colony, productivity was **0.23 chicks fledged per pair**. No nests were lost to flooding at this colony.

Table 4b: Laying (estimated), hatching and fledgling dates for Lesser Black backed Gulls at Carrigeendav and Rams Island on Lough Mask based on 2006 fieldwork.

Lesser Black-Backed Gull	Start of Laying (Estimate)	Completion of Laying	Hatching	Fledging
Carrigeendav	1 st May	16 th May (91% of nests 3 eggs)	24 th May (1-3 day old chicks)	11 th July
Rams Island	1 st May	7 th May (63% of nests with 3 eggs)*	24 th May (1-3 days old)	22 nd June**

*laying not complete – expect that laying was complete by 16th of May as for Carrigeendav

** Accuracy of fledgling date disrupted by fledgling predation, Carrigeendav colony presents a more accurate picture.

GRAVEL ISLAND

This is a small, low lying island just north of Ram's Island. There is a shingle northern tip and the rest is rock, with boulders and some scrub. On 7th May **44 AON** were counted on the island. During May and June only 4 chicks and 2 fledglings were counted on the island (which also had a small Common Gull colony). On 11th July **5 fledglings** were counted.

Based on a breeding population of 44 pairs and 5 fledglings, productivity was estimated at **0.11 chicks fledged per pair**.

3.2.3 Common Gull

The main Common Gull colonies were located at Long Rock and Ram's Island. Smaller numbers were nesting at Gravel Island and Devinish Rocks. All were mixed colonies with Lesser Black-backed Gulls, except at Devinish Rocks. A count of 15 Apparently Occupied Sites was made at Devinish Rocks. No further data was gained from this colony and it is not considered further below.

LONG ROCK

There are two islands at Long Rock. The main island is large and rises straight out of the water at its western shore and slopes down into the water along the eastern shore. It is mainly rock with grassy vegetation along the west of the island and along any cracks and gullies in the rock. The smaller island is much lower lying with very little vegetation aside from short grass along the cracks in the rock and a little scrub.

At the main island **164 AON** were counted on 6th May, 85% of nests had three eggs and 2% of nests were empty. **Mean clutch size was 2.8**. By the 20th May hatching was already underway, with some quite large chicks, 5-10 days old. During this visit lake levels were high but no nests appeared to be flooded. The gulls were very unsettled throughout this visit (probably due to gull predation discovered on the small island, see below). By 26th May some re-laying had begun.

On the small island **46 AON's** were counted on the 6th of May. On the 20th May some of the low lying nests were underwater. On this date the small island was counted after the main island and five dead adults were found, all with wounds to the back of the neck. Predation by mink was suspected. A count of everything left on the island found 62 eggs still in nests; 6 broken or rolled eggs, four dead chicks and no live chicks. 104 eggs were counted on the previous visit, leaving 32 eggs unaccounted for. The unexplained egg losses again suggested mink predation. During visits to the island in the last week of May, no live chicks were recorded though some adults were still incubating.

Common Gull fledglings at Long Rock



On the 22nd June **145 fledglings** were counted on the main island and the water. Three of these were on the small island but it seems unlikely that they came from this island given that no young chicks appeared to have survived.

Based on a breeding population of 164 pairs and 145 fledglings, productivity was estimated at **0.88 chicks fledged per pair** on the main island. No chicks were considered to have survived on the small island. (No adjustment made for re-laying. Nest lost to flooding appeared to be minimal).

Given the likely presence of mink at Long Rock mink traps were placed and checked on the main island, to protect the main colony, between the 26th May and the 1st June. No mink were caught and the traps were removed. No further sign of mink was recorded.

RAM'S ISLAND

As described above (3.2.2) this is the largest occupied island in Lough Mask. The Common Gull colony was located at the southern rocky tip of the island. All the nests were found close together in this one area. Over the Spring the vegetation grew up around the rocks, but it remained open.

On the 7th May **141 AON's** were counted at Ram's Island. 68% of nests had three eggs and 1.5% were empty nests. **Mean clutch size was 2.5**. By 24th May hatching was underway with a lot of 3-5 day old chicks in nests. It was estimated that 10-15 nests were lost due to flooding. On 26th June **57 fledged** Common Gull were counted on the water.

Based on a breeding population of 141 pairs and 57 fledglings, productivity was estimated at **0.4 chicks fledged per pair**. Taking account of approximately 15 nests lost in the flood productivity is estimated at **0.45 chicks fledged per pair**. (This figure does not take account of any possible success after re-laying).

Table 4c: Laying (estimated), hatching and fledgling dates for Common Gulls on Rams Island and Long Rock, Lough Mask, based on 2006 fieldwork

Common Gull	Start of Laying (Estimate)	Completion of Laying	Hatching	Fledging
Rams Island	26 th April	7 th May (68% of nests 3 eggs)*	24 th May (3-5 day old chicks)	26 th June
Long Rock	22 nd April	6 th May (85% of nests with 3 eggs)	20 th May (5 days old)	22 nd June

*Only 68% of nests with three eggs at this time but in the study site still only 66% with three eggs on 16th May.

3.2.4 Common Tern

On 3rd June Eoin McGreal (NPWS Conservation Ranger) made the first count of Common Tern nests on Lough Mask. The colony was located at Annagh Islet and 30 nests were counted. During the gull study **39 AON's** were counted at Annagh on 6th June and only one nest was empty. By 26th June chicks had started to hatch and were still hatching on 11th July.

4. DISCUSSION

4.1 BREEDING NUMBERS

The 2006 survey found the total number of gulls breeding on Lough Mask to be more or less stable since 1977 with the exception of Black-headed gulls. As in 1993 large numbers of Black-headed gull nested on Lough Mask in 2006, but numbers were much lower in 1977 and 2000. Black-headed gulls, more than most gulls, readily move breeding sites between years (Mavor *et al.* 2006). It has been suggested (Whilde, 1993; Eoin McGreal pers. comm.) that the Black-headed Gull colony at Lough Mask moves between nesting sites between here and nearby Lough Carra. A real increase in the Mask Black-headed Gull population is therefore unlikely.

Table 4. Changes in the gull population (no. of individuals) at Lough Mask from 1977 to 2006

Species/year	1977	1993	2000	2006
Lesser Black-backed Gull	732	722	572	564
Common Gull	930	742	268*	772
Black-headed Gull	850	2650	658	2400
Herring Gull	50	2	0	0
Great Black-backed Gull	8	2	0	0
[Common Tern]			[44]	[39]
Total	2,570	4,118	1,498	3,736

* Long Rock was not included in this count, so it is likely to be an underestimate.

Lough Mask is designated as a Special Protection Area under the EU Birds Directive (79/409). The SPA qualifying interest is the Annex I species, Common Tern and Lough Mask supports 1.5% of the national breeding population (44 pairs in 2000). The SPA is also of interest for its breeding population of migratory gulls. In 2000 Lough Mask supported 8.4 % of the national breeding population of Black-headed Gull (329 pairs), 11.7 % of the national breeding population of Common Gull (124 pairs) and 10% of the national breeding population of Lesser Black-backed Gull (286 pairs).

The 2006 survey found that Lough Mask continues to be of national importance for the Annex I species Common Tern and for its breeding populations of Black-headed Gull, Common Gull and Lesser Black-backed Gull.

4.2 HATCHING, LAYING, FLEDGLING DATES, CLUTCH SIZE AND BREEDING SUCCESS.

In 1977 Whilde (1978) completed a survey of all inland nesting gulls from the west of Ireland lakes including those in Sligo and Donegal. Between 1976 and 1984 Whilde (1984) completed a long term study of a Common Gull colony on Lough Corrib. These studies provide the only other data regarding hatching, laying, fledgling dates, clutch size, and breeding success on Lough Mask or on the nearby lakes of Lough Corrib and Lough Carra. The 2006 results are therefore considered in this context.

BLACK-HEADED GULL

According to Whilde (1978) no Black-headed Gull chicks were present on Lough Mask on the 16th of May. This contrasts with our results where 1-3 day old chicks were recorded on this date and this appeared to be the start of hatching.

The average clutch size at the major Black-headed gull colonies covered by Whilde (1978) ranged from 2.81 on Lough Carra and 2.35 on Seagull Islands on Lough Mask. This is comparable to a mean clutch size of 2.76 for Black-headed gulls at Annagh Islet in 2006.

Productivity at Annagh Islet was 0.7 chicks fledged per pair. Whilde did not record breeding success in 1977, so there is no local data with which to make comparisons.

COMMON GULL

Whilde suggested that the main period of laying at the major Common Gull colonies in the west of Ireland was in the first half of May (Whilde, 1978). The 2006 results suggest that laying was complete around the 10th of May, suggesting that the main laying period is now about one week earlier.

The mean clutch size for Common Gull was 2.8 at Long Rock and 2.5 at Rams Island in 2006. Whilde (1978) recorded a maximum clutch size at Lough Corrib of 2.93 and a minimum at Carrigeendavoe on Lough Mask of 2.31. Common Gull clutch sizes on Lough Mask in 2006 were comparable to those found by Whilde in 1978.

In 2006 fledglings were recorded on the 22nd June at Long Rock and the 26th June at Rams Island. Whilde recorded the first fully fledged Common Gulls on Lough Mask on 17th June. This is comparable to the 2006 findings.

At Long Rock productivity in 2006 was 0.88 chicks fledged per pair, while at Rams Island 0.35 chicks fledged per pair. At Birchall on Lough Corrib Whilde (1978) estimated that a minimum of 0.3 chicks fledged per pair. A study of a Common Gull colony on Lough Corrib between 1976 and 1984 (Whilde, 1984) found an average of 0.66 fledged young per pair over this period (colony size 50 nests). While historical data on breeding success is limited for the inland lakes and absent for Lough Mask in particular, the data for nearby Lough Corrib suggest similar productivity levels were present in 1977 for Common Gull as recorded in 2006.

LESSER BLACK-BACKED GULL

Whilde (1978) suggests that the middle of May was probably the main laying period for Lesser Black-backed Gulls on Lough Mask. The 2006 results show that laying was complete by around the 16th May and therefore that the main laying period was about one week earlier.

The average clutch size recorded in 2006 on Carrigeendavoe was 2.86. Whilde (1978) recorded a comparable average clutch size of 2.77 on Saints Island, Lough Mask.

Productivity at Carrigeendavoe was the highest of all colonies at 1.15 fledged young per pair. At Ram's Island, fledgling rates were much lower with only 0.35 fledged per pair. There is no historical data with which to compare these results.

The above comparison suggests that for the Lough Mask Gull colonies hatching began about one week earlier in 2006 than in 1977 and that clutch size remains similar to that found in 1977. The limited productivity data available prior to the 2006 survey shows similar numbers of Common Gull chicks surviving to fledglings. There is no other productivity data available for the other species.

4.3 BREEDING SUCCESS

In terms of productivity, the Lesser Black backed colony at Carrigeendauv was the most successful with 1.15 chicks fledged per pair. Productivity was lowest at Rams Island and nearby Gravel Island where Common Gull and Lesser Black-backed Gull produced 0.4 chicks fledged per pair or less. Common Gulls at Long Rock and Black-headed Gulls at Annagh Islet fared better with 0.7 and 0.8 chicks fledged per pair.

According to Perrins 2001 (cited in Mavor *et al.* 2002) about one fledgling per pair is needed to maintain a population of breeding seabirds. Productivity at all islands except Carrigeendauv was below 1 fledgling per pair.

There are a number of reasons for poor breeding success amongst seabirds. Possible reasons include weather, food availability, nesting habitat, disease and predation (Mitchell *et al.*, 2004). While this project did not set out to study any of these reasons in relation breeding success, some comment can be made with regard to weather, nesting habitat and predation.

4.4 FACTORS AFFECTING BREEDING GULLS ON LOUGH MASK

4.4.1 Weather

Heavy rainfall during the first half of May caused lake levels on Lough Mask to rise by approximately 1 metre. Flooding of nests was most severe at Annagh Islet and Carrigeendauv. While re-laying took place, overall clutch and chick survival is likely to have been lowered. The inclement weather probably affected productivity at all islands causing eggs to chill and any newly hatched chicks to die.

4.4.2 Nesting Habitat

The 2006 survey did not undertake any systematic evaluation of nesting habitat on the Lough Mask islands. General habitat notes were made on islands currently and historically occupied by nesting gulls (Appendix 3). It was observed that a number of islands, occupied by nesting gulls in previous years, were very over grown with scrub and trees. Some of these islands did not seem to provide suitable gull nesting habitat. It is possible that in the past these islands may have been grazed and therefore less densely vegetated. Changes in habitat may therefore have reduced the amount of suitable nesting habitat for breeding gulls on Lough Mask.

4.4.3 Predation

Evidence of mink predation was found at two of the gull colonies on Lough Mask. Early in the nesting season five dead adults were found at Long Rock, on the smaller of the two islands. The wounds on the adults, which were to the back of the neck, are

consistent with wounds made by mink. There also appeared to be a large number of missing eggs, which also suggests mink (Craik, 1995). Later in the nesting season, 23 dead Lesser Black-backed Gull fledglings and three dead adults were found at Rams Island. Again due to the wounds, mink was suspected. A mink was trapped on the Island a few days later.

Mink are an introduced species and are now resident throughout Ireland (Hayden *et al.*, 2000). They have long been suspected as being harmful to populations of ground nesting birds in Ireland (Smal, 1991) and their devastating effects on breeding seabird populations in Scotland have been well documented (Craik, 1995, 2004, 2005). Mink predation causes complete breeding failures, adult mortality and ultimately site abandonment (Mitchell, *et al.*, 2004).

Mink are adept swimmers and can swim as far as 2 km from shore. All the islands on Lough Mask are less than 2 km from the shore and are therefore at risk from mink predation. Interestingly, Carrigeendauv, which was the most successful nesting site, is the most remote island on Lough Mask. All the other nest sites are 2km or less from the shore with islands in between. Carrigeendauv is not linked to the shore by any other islands.

In relation to detecting mink predation Craik (1995) describes that where such predation exists a decrease in total numbers of breeding gulls may go unnoticed for several or many years. The value of measuring productivity is stressed. Further he notes that unlike many other regular causes of breeding failures of seabirds, mink predation appears to be annual.

Lough Mask provides nesting habitat for ground nesting wildfowl such as Swans, Mallard, Tufted Duck and others. These birds will also be affected by mink predation.

5. CONCLUSION

The 2006 survey found that Lough Mask continues to be of national importance for breeding gulls. While total breeding numbers appear to be stable, productivity data shows breeding success to be moderate to poor, except at one colony. While other factors may be affecting breeding success, predation by mink was proven at one colony and suspected at another. Predation by mink can cause complete breeding failures, which over successive years will cause a decrease in the total breeding population. Lough Mask is a Special Protection Area for Birds under EU Birds Directive 79/409. It is important for nesting Common Tern and gulls, species which are particularly vulnerable to mink predation. Given that predation by mink has been proven at Lough Mask a mink control programme should now be introduced similar to that which has been running successfully in Scotland (Craik, 2004, 2005). Such a programme would remove mink from the gull and tern colonies and this would also benefit other ground nesting birds. A mink control programme operating in conjunction with continued monitoring of nesting numbers and breeding success, will allow the effects of mink to be properly assessed. Given the results from the Lough Mask survey, a complete re-survey of all of Connaught's inland lakes, to take account not only of breeding numbers but also breeding success, is required.

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APPENDICES

Appendix 1
DESCRIPTION OF COLONIES AND ACCOUNT OF FIELDWORK

M125 685	CARRIGEENDAUV	Lesser Black-Back Gulls
<p>This island is the most northerly of the colonies. The interior is dense scrub and is largely impassable. The shoreline eastern shoreline has overhanging trees and scrub, while the western shoreline is more open and low lying with rocks and boulders. It is a long narrow island. Only Lesser Black-backed Gulls nesting. They nested all along the shore and in the interior at the South tip where the scrub opened up. Many nests were under trees or down between rocks.</p>		
Date	Laying, hatching, fledgling	Other observations
27 th April	72 AON 50 with empty nests	
7 th May	143 AON 60% with clutches of 3 eggs; 16% with empty nests	All nests were counted.
16 th May	37 nests in study site recovered 34 out of 37 with 3 eggs (91%) 1 with 0 eggs. Total eggs 106	Study site only counted Weather poor
24 th May	First chicks hatched (1-3 day old) No nest count made	Island flooded, west shore impassable Estimated one third of nests lost (Photo)
6 th June	Re – laying underway Many cool eggs found – incubation not yet started? Empty nests found, which looked successful, but chicks not found Many failed nests with cold eggs More chicks (1-5 days from first laying.	Water levels receded. Vegetation very high and dense
26 th June	64 nearly fledged young (in water and on land) Many young still with downy heads. Eggs still to hatch	
11 th July	165 fledged Fledglings all on water or in the air 2 chicks on land; 2 eggs.	Found lumps of meat and fat and stashes of dead crayfish, whole and claws (Photo)

M135 665	ANNAGH ISLET	Black-headed Gull, [Common Tern]
This is a small low lying island just south of Aghinish Point on Lough Mask's east shore. It is a shingle island with tall grass vegetation in the summer. There are a few dead trees. Black-headed Gull nests covered most of the island. Common terns nested on a shingle bar, at the north end of the island.		
Date	Laying, hatching, fledgling	Other observations
27 th April	Estimated 1200 AON (939 AON counted for 4/5ths of the colony; extrapolated to 1200 AON) Of 939 actual AON, 2% with 0 eggs; 62% with 3 eggs	Island covered with nests.
7 th May	42 out of 50 nests with 3 eggs (84%) All nests with at least 1 egg. Total eggs in study site 138.	Study site only counted
16 th May	Hatching started (1-3 day old chicks) 23 nests recovered in study site 9 chicks in study site	Study site only counted
24 th May	Chicks still hatching Older chicks running around Estimated 200 nests under water	Heavy rainfall and water very high Island may be one third under water Main concentration of nests survived Study site no longer useful
[3 rd June	30 Common Tern nest	From Eoin McGreal report]
6 th June	Lots of activity; large and small chicks [39 Common Tern nests (48% with three eggs; 1 with 0 eggs)]	No data could be gathered from study site.
26 th June	844 young mostly fully fledged All young counted on the water Only dead fledglings on the island Common tern chicks and eggs	
11 th July	107 fledglings counted on the water. Tern eggs chicks hatching, one chick on the water.	

M134 596	LONG ROCK	Common Gull Lesser Black-backed Gull
<p>This site consists of a main island and a smaller island. Both islands rise higher out of the water at the western side and slope down into the water on the eastern side. The smaller island is very low lying and is 90% bare rock, with a few willow trees and some vegetation along the cracks in the limestone. The larger island is 60% vegetated with mainly grass covering the upper slopes and with more exposed rock as the islands slope into the water. The islands lie 5km inland from the main lake and are connected to it by the Cong canal. Nest were located across both islands, concentrated back from the low lying eastern shore.</p>		
Date	Laying, hatching, fledgling	Other observations
6 th May	<p><u>Main island:</u> Common Gull 164 AON 85% nests with 3 eggs; 2% nests empty; Total eggs 467. Lesser Black Back's 6 AON.</p> <p><u>Small island:</u> Common Gull 46 AON 60% nests with 3 eggs; 13% nest empty</p>	<p>The small is probably sub optimal habitat used by less experienced birds. Results from the main island are considered to be more representative.</p> <p>35 nests marked as study site on the main island</p>
20 th May	<p><u>Main island:</u> Hatching started; chicks up to 5-10 days old. Out of 20 marked nests recovered holding 57 eggs, there were 23 chicks</p> <p><u>Small island:</u> 5 dead adults with wound to back of head/neck 62 eggs still in nests; 4 dead chicks; 5 broken eggs and one rolled. 104 eggs counted on first visit leaving 32 eggs unaccounted for.</p>	<p>Study site only checked on main island. Gulls very restless and reluctant to settle.</p> <p>Mink suspected due to dead adults and egg losses on small island.</p> <p>Heavy rainfall flooded out low lying nests on small island.</p>
26 th May, 29 th May, 1 st June	<p>No live chicks on small island, some nests still active with incubating adults.</p> <p>Re-laying on main island.</p>	<p>Mink traps placed on main island. Nothing caught and no further sign of disturbance on either island.</p>
22 nd June	<p>145 fledglings, most on the verge of flying and some flying. Still some eggs to hatch No activity on small island</p>	<p>Three fledglings were counted on the small island but it is more likely that they were chicks from the main island</p>

M091 598	RAM'S ISLAND	Common Gull Lesser Black-backed Gull
<p>The largest occupied island and the only grazed (sheep and goats). The interior is a grass and bracken hill. Low lying land around the hill is trees, shingle and grassland from the north end and along the east shore. The south tip is grass grading into bare rocks and the west shore is rocks and boulders with areas of grass. The Common Gull colony was discrete and was located on the rocky southern tip of the island. Lesser Black-backed Gulls were distributed along both the rest of the low lying ground around the island. Most were next to boulders, trees, tree stumps, grass clumps. They were mainly in quite open ground.</p>		
Date	Laying, hatching, fledgling	Other observations
27 th April	<p><u>Common Gull</u> - 138 AON, 25% empty nests; 27% with 3 eggs.</p> <p><u>Lesser black back Gull</u> – 43 AON; 60% empty nests, 0 with 3 eggs.</p>	
7 th May	<p><u>Common Gull</u> – 141 AON, 1.5% empty nests, 68% with 3 eggs. Total eggs 356.</p> <p><u>Lesser Black back Gull</u> – 89 AON, 16% empty nests; 63% with 3 eggs. Total eggs 195.</p>	Data is from full colony counts.
16 th May	<u>Common Gull</u> - 66% of nests with 3 eggs; 0 empty nests. 2 nests with broken eggs (2/3 broken and 1/3 broken)	Common Gull study site only. Weather poor.
24 th May	<p><u>Common Gull</u> – a lot of 3-5 day old chicks. Hatching well underway.</p> <p><u>Lesser Black-backed Gulls</u> – hatching just underway, with a few 1-3 day only chicks, lots of chipping and lots of eggs still to go.</p>	<p>High lake levels, but this island least affected. Some low shore Common nest probably lost (10-15 perhaps)</p> <p>Found stashes of latherjackets, (crane fly larvae) at edge of Lesser Black back colony (photo)</p>
6 th June	Some Common Gull and Lesser Black-backed Gull chicks just hatched. Larger chicks must have been hiding.	Found very few chicks, though nests suggested they had successfully hatched – intact and covered in droppings. .
26 th June	<p><u>Common Gull</u> – 57 fledged</p> <p><u>Lesser Black-backed Gull</u> – 21 fledged</p>	Dead Lesser Black back Gull fledglings all along west shore of lake. All with wounds to back of head. Found remains of other fledglings. (Photo's)
11 th July	<p>Common Gull – 27 fledglings</p> <p>Lesser Black-backed Gull – 10 fledglings</p>	Dead Mink caught in boat man's trap.

M093 609	“GRAVEL ISLAND”	Common Gull Lesser Black-backed Gull
A long narrow, but small low lying island with some shingle spit at its north tip, and rocky shore elsewhere. There is some scrub and other vegetation and it is rock strewn.		
Date	Laying, hatching, fledgling	Other observations
27 th April	<u>Common Gull</u> – 16 AON <u>Lesser Black back Gull</u> – 17 AON	
7 th May	<u>Common Gull</u> – 20 AON <u>Lesser Black back Gull</u> – 44 AON	
16 th May		Not surveyed, due to weather
24 th May	<u>Common Gull</u> – 2 chicks <u>Lesser Black back Gull</u> – 0 chick	
6 th June	<u>Common Gull</u> – 0 chicks <u>Lesser Black back Gull</u> – 1 chick	
26 th June	1 new chick, 2 fledglings, 1 dead fledgling	Few live chicks
11 th July	<u>Common Gull</u> – 2 fledged <u>Lesser Black-backed Gull</u> – 5 fledged	

M117 647	DEVINISH ROCKS	Common Gull
A collection of rocks which support a few Common Gull nesting sites. Landing is not possible. It is also not possible to get very close, due to the shallow and rocky nature of the area.		
Date	Laying, hatching, fledgling	Other observations
27 th April	15 AOS	Not possible to establish clutch size

Appendix 2

HISTORICAL USE OF ISLANDS BY NESTING GULLS ON LOUGH MASK, HABITAT NOTES FROM 2006 SURVEY AND DISTANCE OF ISLAND FROM THE SHORE OR NEAREST OTHER ISLAND

Island	History	Colony in 2006	Habitat in 2006	Distance from shore or next island on way to shore
Ram's island	1988, 90 and 1999	yes	Grazed	1.6 km to Saints Island then to shore
Carrigeenagur	1988, 90 and 1999	no	Rock/stone shore, scrub interior	2 km to Inishgleasty then 0.3 km to shore (0.7 km to Ram's)
Carrigeenawelaun	1988, 90	no	Rock/stone shore, scrub interior	2.1 km direct to shore (0.8 to Ram's then to shore)
“Gravel” Island	No known history	yes	Shingle/stone/ grass clumps, few trees	2.5 km direct or 0.5 km to Carrigeenaweelaun then Ram's then shore
Carrigeendavoe	1977, 1988, 90 and 1999	no	Rock/stone shore, scrub interior	1.2 km direct to shore
Carrigeenroe	1988, 90 and 1999	no	Scrub and trees, little shore	0.2 km direct to shore
Long Rock	1988, 90	yes	Mainly rock with some grass cover	0.1 km direct to shore
Shanvally	? 1988, 90	no		1.9 km or 0.6 km to Black Rocks
Black Rocks	? 1988, 90	no	Rocks	1.2 km direct to shore
Carrigeenbaun	1995	no	Rock/stone shore, scrub interior	2.2 km direct to shore, or via islands with greatest stretch 0.8km
Devinish Rocks	1999	yes	Rocks	1.9 km direct to shore or via islands as above
Rialisk	1995	no	Rock/stone shore, scrub interior	0.5 km direct to shore
Unnamed islet S M648133	1995	no	Shingle, low lying	0.8 km direct (0.5 km to Shangorman)
Shangorman	1995	no	Wooded	0.3 km direct to shore
Carrigeenawella	1995	no	Rock/stone shore, scrub interior	0.5 km direct to shore
Unnamed islet N	1999	yes	Shingle/stone/ grass clumps, few trees	1.1 km direct to shore
Carrigeendauv	1977, 1988, 90 and 1999	yes	Rock/stone shore, scrub interior	1.5 km direct to shore
Seagull islands	1977, 1988, 90 and 1999	no	Rock/stone shore, scrub interior	0.2 km direct to shore
Saints Island	1977	no		0.9 km direct to shore

Appendix 3 – photos removed as file too big.