Great Northern Diver – Disturbance Survey

ABP Additional Information 23/01/2015

Further to last Thursday's discussion between Dr. David Tierney from the NPWS and Dr's. Chris Peppiatt and Tom Gittings regarding discrepancies in published literature regarding the flushing distances of Great Northern Diver, additional information has been prepared based on surveys completed yesterday, 23/01/2015. Previously submitted evidence was based primarily on land based observation of Great Northern Diver habits in Galway Bay, whereas, NPWS queried if similar habits were likely in open water. A summary of the information is provided below.

Summary

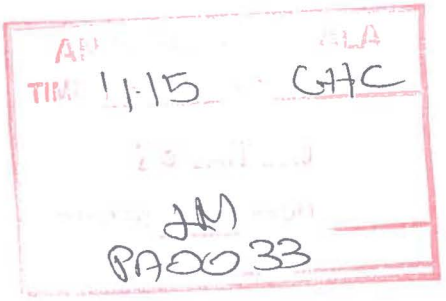
A survey of Great Northern Diver responses to boat disturbance was carried out on 22 January 2015. The survey was carried out using a 15.45 m boat along a survey route of 37 km. Great Northern Diver were recorded in open water in Galway Bay throughout the area surveyed, which extend from the harbour across the bay to Island Eddy and out to the shipping channel at Black Rock. Numbers recorded (57 observations of 64 birds) were considered sufficient to draw inferences regarding disturbance distances. Calculations indicate that these numbers are broadly consistent with the range of densities recorded during I-WeBS counts of the coastal fringe.

When approached by boat travelling at 5-10 knots, no Great Northern Diver flushed (i.e. flew away). This included six observations of birds within 50 m (including birds as close as 10-20 m) and a further 14 observations within 50-100 m.

Great Northern Divers did appear to respond to close approach (within 100 m) by diving, although this may not always have been a disturbance response. However, at maximum, this response would only cause a temporary suspension of normal behaviour for 20 seconds (at a speed of 10 knots), or 40 seconds (at a speed of 5 knots). This would not incur any significant energetic cost and would not, therefore, have any population-level consequences.

Full details of the survey methodology and results and constraints on the interpretation of the results are presented in the accompanying report.

Tom Gittings, 23 January 2015



GALWAY HARBOUR EXTENSION: GREAT NORTHERN DIVER DISTURBANCE SURVEY

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1. INTRODUCTION

This report presents the results of a survey of the response of Great Northern Diver to boat disturbance in Inner Galway Bay. Observations on responses of Red-throated Divers were also collected.

2. METHODOLOGY

The survey was carried out between 09:00-12:00 on 22 January 2015. Conditions were excellent for surveying with a sea state of 2-3.

The survey used the Cailín Ór ferry. This is a Kingfisher 50 Class VI boat with length of 15.45 m, breadth 5 m, draft 2 m and 41 gross tonnage. The boat provided an observation deck around 4 m above the sea surface.

The survey covered a route of around 37 km from Galway Harbour around Tawin Island, to Island Eddy, then back across the middle of the bay, picking up the shipping channel off Black Rock and following the shipping channel back into the harbour (Figure 1).

The boat was driven at constant speeds of 5 knots on the outward leg (to Island Eddy), and 10 knots on the return leg. These speeds were selected as they represent typical speeds for boats in Inner Galway Bay during winter.

The survey was carried out by three observers: Dr Tom Gittings, Dr Chris Peppiatt and Paul Troake. Paul Troake is an accredited European Seabirds at Sea surveyor.

At the start of the survey, initial training in distance estimation was carried out. This involved the three observers independently estimating the distance of the boat from fixed points (such as a buoy), and comparing this with the true distance as measured by the navigation system in the boat.

During the survey, each diver encountered within 500 m of the boat was noted and the following details recorded:

- The time of the observation.
- A GPS waypoint representing the position of the boat at the time of the observation.
- The closest distance from the bird at which the boat passed. These distances were recorded in the following distance bands: 0-50 m, 50-100 m, 100-150 m, 150-200 m, 200-300 m, 300-400 m and 400-500 m. For observations within the 0-50 m and the 50-100 m distant bands, the actual distance was usually estimated to the nearest 10 m.
- For birds showing a disturbance response, the initial distance at which the bird was located, compared to the distance at which it showed a disturbance response (if within different distance bands).
- The nature of the disturbance response (if any), classified as either *flush* or *dive*. The *flush* response was recorded for birds that took flight in response to the approach/passage of the boat. The *dive* response was recorded for birds that appeared to dive in response to the approach/passage of the boat. It can be difficult to determine whether a dive is due to the influence of the boat, as divers feed by diving. However, *dive* responses were recorded for two scenarios: where the bird was not actively feeding as the boat approached but then dived; and/or when the bird dived using a sudden movement, different from its normal dive. Nevertheless, there will be some uncertainty in assigning the *dive* response and we took a conservative approach (i.e., assigning a *dive* response when there was any uncertainty about whether the dive was due to disturbance).
- Notes on any further relevant details, such as the behaviour of the bird, etc.

3. RESULTS

A total of 57 observations of 64 Great Northern Divers, and three observations of three Red-throated Divers were recorded. In addition one Great Northern Diver, four Red-throated Divers and two unidentified divers were seen in flight only (not flushed by the boat).

No Great Northern Divers were flushed by the boat, even though the boat passed within 10-20 m of some birds.

Ten Great Northern Divers were recorded showing the *dive* response, all within the 0-50 and 50-100 m distance bands (Table 1 and Table 2). All six birds recorded within 0-50 m distance band showed the *dive* response (n = 4 at 5 knots; n =2 at 10 knots). Within the 50-100 m distance band, one of seven observations at a speed of 5 knots showed a *dive* response, compared to three out of seven observations at a speed of 10 knots. Therefore, there is a possible indication of a greater response at the higher speed, although the data is very limited, and the difference could just be chance variation. It should also be noted that, as discussed above, there is considerable uncertainty in assigning the *dive* response, and some birds recorded as showing this response may just have been feeding normally.

In several observations of birds showing the *dive* response, it was noted that the birds resumed feeding normally, or swimming (for birds that had not been feeding) immediately after the boat passed.

The distribution of Great Northern Diver *dive* responses did not show any obvious pattern of being associated with the middle of the bay (Figure 1), although the pattern will be biased by uneven distribution of observations within the 0-50 m and 50-100 m distance bands.

Two of the three Red-throated Divers recorded showed the flush response, while the third was recorded at a long distance from the boat (400-500 m). Both birds that flushed flew considerable distances before resettling (0.5-1 km, and more than 1 km, respectively).

Table 1. Observations of Great Northern Divers by distance band and their response to the approach/passage of the boat

	5 knots		10 knots		Totals
Distance band (m)	**dive response**	**no response**	**dive response**	**no response**	
0-50	4		2		6
50-100	1	6	3	4	14
100-150		6		4	10
150-200		2		4	6
200-300		11		4	15
300-400		3		1	4
400-500		1		1	2

Table 2. Numbers of Great Northern Divers by distance band and their response to the approach/passage of the boat

	5 knots		10 knots		Totals
Distance band (m)	**dive response**	**no response**	**dive response**	**no response**	
0-50	4		2		6
50-100	1	6	3	4	14
100-150		6		4	10
150-200		2		3	5
200-300		16		6	22
300-400		3		1	4
400-500		1		2	3

4. DISTURBANCE IMPACT

4.1. IMPACT OF SMALL BOATS TRAVELLING AT SLOW TO MODERATE SPEEDS

The instantaneous area disturbed by a moving disturbance source can be calculated from the following formula (after Smit and Visser, 1993):

Area disturbed (m^2) = $\pi r_2^2 + 2r_1.h_1.s + 2(r_2-r_1).h_2.s$

where s = speed in m/s, r_1 = flight distance in metres (zone 1); r_2 = distance at which birds stopped feeding in metres; h_1 = recovery time from zone 1 in seconds; h_2 = recovery time from zone 2 in seconds.

For Great Northern Diver in Galway Bay at boat speeds of 5-10 knots, $r_1 = 0$. Therefore, the equation can be simplified to:

Area disturbed (m^2) = $\pi r_2^2 + 2.r_2.h_2.s$

Taking a maximum value of r_2 = 100 m, and assuming a recovery time of r_2/s (as birds showed an immediate resumption of normal behaviour after the boat passed), the area disturbed by a single boat is 5.1 ha[1]. The projected total number of fishing and recreational boats on the water during winter is 12. Therefore, the total area disturbed (assuming no overlap between boats) would be 62 ha, which amounts to 1% of the total area of subtidal habitat within the SPA.

The above figure is a precautionary estimate, as it assumes that all birds within 100 m of a boat are disturbed, whereas our observations show that this is not the case. Moreover, the actual disturbance impact is minor (suspension of normal behaviour for 20 seconds at a speed of 10 knots and 40 seconds at a speed of 5 knots. This would not incur any significant energetic cost and would not, therefore, have any population-level consequences.

4.2. IMPACT OF OTHER BOAT/SHIP TRAFFIC

This survey did not examine responses to either boats travelling at greater speeds (e.g., a RIB travelling at 20-30 knots), or to large ships.

Boats travelling at higher speeds of 20-30 knots are generally rare, mainly occurring in summer, and would usually be leisure RIBS (Captain Brian Sheridan, Galway Harbour Company, pers. comm.). Therefore, this is unlikely to be a significant disturbance pressure to Great Northern Divers in winter.

Observations of ships entering or leaving Galway Harbour indicate that Great Northern Divers do not show a significant disturbance response to the passage of large ships. While we do not have data on the response of divers to shipping traffic along the shipping channel further out in Galway Bay, the results of the present survey indicate that the disturbance response of Great Northern Divers does not vary significantly between the harbour area and the middle of the bay.

5. DENSITIES

While this survey was not designed as a population census, it is possible to use the results to make an estimation of Great Northern Diver densities in the middle of Inner Galway Bay. There are two potential biases in using the data in this way: the survey was designed to find Great Northern Divers so the survey route was not a representative transect (i.e., the divers may have been over-recorded); and because observers watched divers to record their reactions to disturbance it is possible that some birds may have been missed (i.e., the divers may have been under-recorded).

Therefore, the calculated density from the present survey should not be regarded as an accurate estimate of the density of Great Northern Divers in the middle of the bay. Instead, the purpose of

[1] Note the area affected is the same at both boat speeds, as the factor used to calculate h_2 cancels s.

the following calculation is simply to determine whether the number of divers recorded in the middle of the bay in this survey is broadly consistent with the densities calculated from I-WeBS data.

Excluding loops, etc., the survey route covered a distance of around 27 km in the open bay; i.e., outside the coastal fringe as defined by the seaward boundary of the I-WeBS subsites.

The data presented in Table 1 and Table 2 indicates that the detectability of divers was similar in the 0-100 m, 100-200 m and 200-300 m distance bands, but decreased beyond 300 m.

Therefore, to calculate densities, I have used a 600 m transect width, have only included birds recorded within 300 m of the boat, and have excluded birds recorded in the coastal fringe and on the loops away from the main transect route. This gives a total of 52 birds recorded in an area of 1620 ha, which equates to a density of 3.2 birds/100 ha.

The density of 3.2 birds/100 ha estimated in this survey compares to the mean density of 2.4 birds/100 ha calculated from I-WeBS data. The latter is a mean figure across six counts with a range across these counts of 1.6-3.6 birds/100 ha. Therefore, the density estimated from this survey is within the range of densities calculated from the I-WeBS counts.

6. REFERENCE

Smit, C.J. & Visser, G.J.M. (1993). Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area. Wader Study Group Bulletin, 68, 6–19.

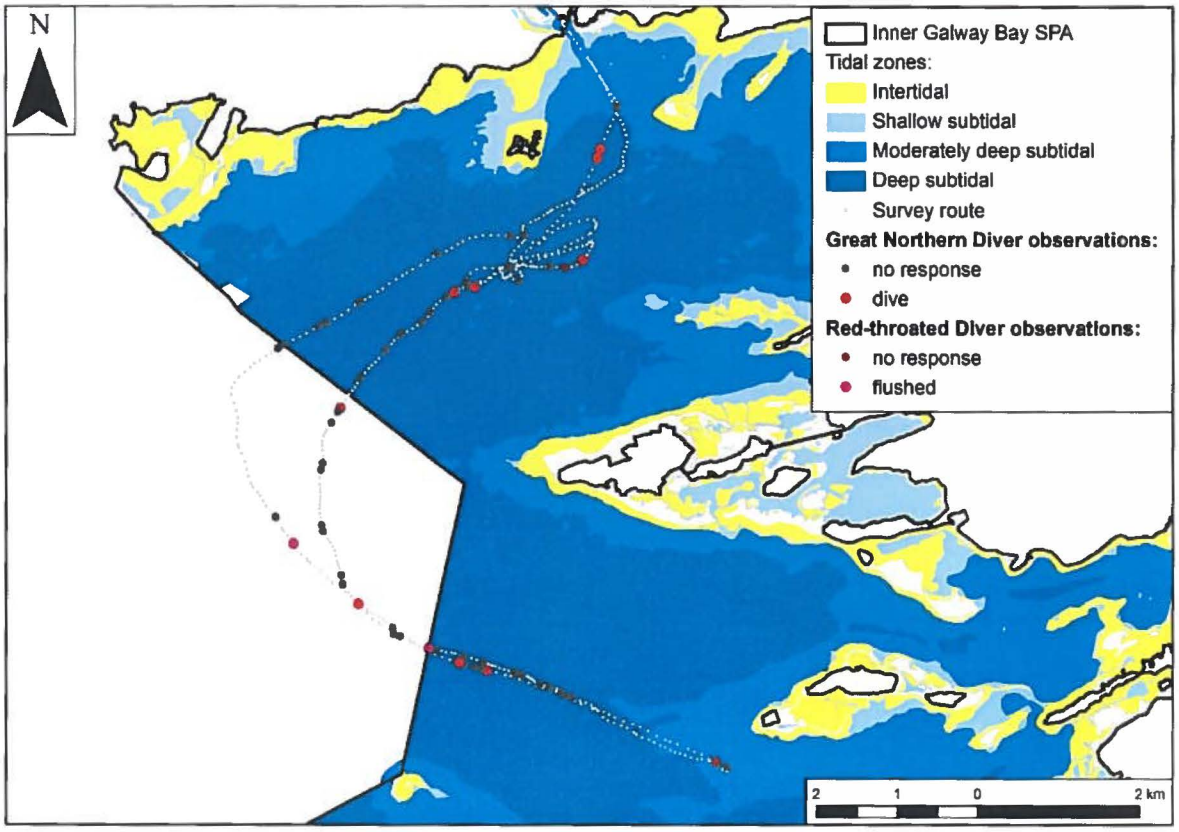

Figure 1. Survey route and distribution of diver observations