

Disturbance response of Great Northern Divers *Gavia immer* to boat traffic in Inner Galway Bay

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A survey of Great Northern Divers *Gavia immer* at Inner Galway Bay (57 observations of 64 birds) indicate that they do not show a 'flush' response to boat traffic, even when the survey boat passed within 10 to 20 m of some birds, although some did show a 'dive' response. However, two of three Red-throated Divers *Gavia stellata* showed a 'flush' response at distances of about 15 m, and just over 100 m, from the survey boat.

Introduction

Divers are generally regarded as highly sensitive to disturbance. For example, Furness *et al.* (2013) classified the sensitivity of Black-throated *Gavia arctica*, Red-throated *Gavia stellata* and Great Northern Divers *Gavia immer* to disturbance from ship and helicopter traffic as 5 on a scale of 1 to 5, where 5 represents "strong escape behaviour, at a large

response distance". Furthermore, the guidance for carrying out European Seabirds at Sea (ESAS) surveys refer to the need to scan the sea area ahead of the ship "to detect the takeoff of usually very wary seabird and divers well ahead of the approaching platform" (Camphuysen *et al.* 2004). However,

Plate 76. Great Northern Diver (Michael O'Clery).

there appears to be very little published evidence on the response of divers to marine traffic.

Inner Galway Bay supports an internationally important population of Great Northern Divers, with a mean annual peak count of 197, and a maximum count of 305, during 2009/10 to 2013/14 (Irish Wetland Bird Survey data, accessed at www.birdwatchireland.ie/?tabid=111 on 31 October 2015), compared with the 1% international importance threshold of 50. Great Northern Divers occur around the entire shoreline of Inner Galway Bay, but little is known about their distribution in offshore waters in the bay as the I-WeBS counts do not cover these areas, and there have not been any detailed Seabirds at Sea surveys within the bay. The proposed Galway Harbour Extension project is projected to cause a 25% increase in shipping traffic (from 177 to 210 vessels per year), and a 20% increase in recreational and fishing boat activity in winter (from 10 to 12 boats per day, excluding weekly yacht races). Due to their perceived sensitivity to disturbance, the potential impact of this increase in marine traffic on the Great Northern Diver population of Inner Galway Bay was an issue of concern. Therefore, a survey was carried out to quantify the response of Great Northern Divers to boat traffic. Here we report the results of this survey, and provide the first published evidence about the response of Great Northern Divers to marine traffic.

Methods

The survey was carried out between 09.00-12.00 hours on 22 January 2015. Conditions were excellent for surveying with a sea state of 1-2. The survey used the Caillín Ór ferry. This is a Kingfisher 50 Class VI boat with a length of 15.45 m, breadth of 5 m, draft of 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 (grid ref M3024) around Tawin Island (M2919), to Island Eddy (M3215), then back across the middle of the bay, picking up the shipping channel off Black Rock (M2621) 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 (the authors of this paper). 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, the time of the observation was recorded,

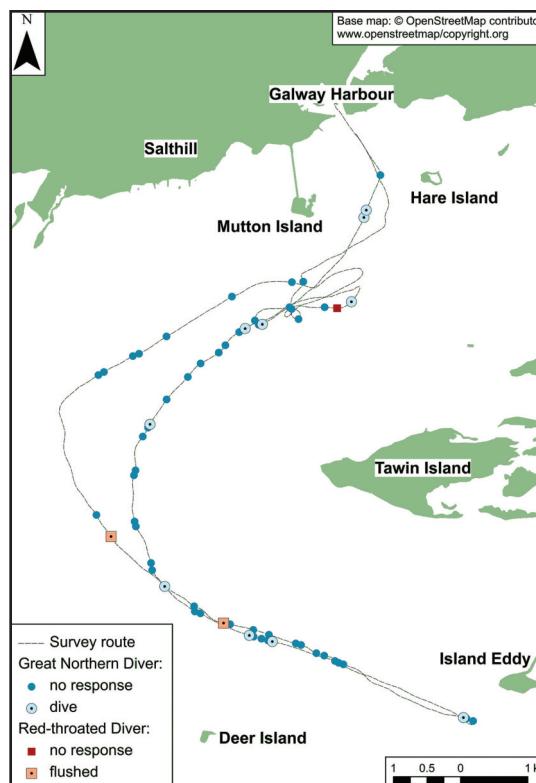


Figure 1. Survey route and distribution of diver observations, Galway Bay, January 2015.

and a GPS waypoint was taken representing the position of the boat at the time of the observation. The closest distance from the bird at which the boat passed was recorded using the following distance bands: 0 to 50 m, 50 to 100 m, 100 to 150 m, 150 to 200 m, 200 to 300 m, 300 to 400 m and 400 to 500 m. For birds showing a disturbance response, we also recorded 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). We classified the nature of the disturbance response (if any), as either 'flush' or 'dive'. The 'flush' response was recorded for birds that took flight in response to the approach and/or passage of the boat. The 'dive' response was recorded for birds that appeared to dive in response to the approach and/or 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). Note that part of the return survey route followed the outward route. Therefore, some birds may have been involved in more than one observation.

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 to 20 m of some birds. Ten Great Northern Divers were recorded showing the 'dive' response, all within the 0 to 50 m and 50 to 100 m distance bands (Table 1). All six birds recorded within the 0 to 50 m distance band showed the 'dive' response ($n = 4$ at 5 knots; $n = 2$ at 10 knots). Within the 50 to 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. It should also be noted that, as mentioned 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 to 50 m and 50 to 100 m distance bands.

Two of the three Red-throated Divers recorded showed the 'flush' response (at distances of about 15 m, and just over 100 m, from the boat), while the third was recorded at a long distance from the boat (400 to 500 m). Both birds that flushed flew considerable distances before resettling (0.5 to 1 km, and more than 1 km, respectively).

Table 1. Numbers of Great Northern Divers by distance band and their response to the approach and or passage of the boat, Galway Bay, January 2015.

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



Plate 77. Great Northern Diver (Michael O'Clery).

Discussion

This survey indicates that in Inner Galway Bay, Great Northern Divers are not significantly disturbed by medium-sized craft travelling at slow to moderate speeds. While the survey was only carried out on a single day, it is notable that not a single incident of a Great Northern Diver being flushed by the boat was observed. The results of the survey accord with the casual observations of two of the authors that Great Northern Divers in Irish coastal waters are not very sensitive to disturbance by marine traffic. In Cork Harbour, Great Northern Divers regularly feed in and around the main navigation channel at the mouth of the harbour and have been observed to tolerate close passage by large ships and smaller craft without any significant response (TG, pers. obs.). Similarly, in Inner Galway Bay, Great Northern Divers in the area around the existing harbour do not show any significant response to normal ship and boat traffic (CP, pers. obs.). However, Great Northern Divers have been flushed when driven directly at in a rigid inflatable boat (RIB) at speeds of 20 to 30 knots (CP, pers. obs.).

Our results may appear to be in conflict with the general perception in the literature about the disturbance sensitivity of divers. However, we have not found a single study that reports detailed observations, or quantitative data, on the disturbance response of Great Northern Divers. Nevertheless, it is possible that Great Northern Divers in areas with low levels of ship and boat traffic may be more sensitive to disturbance. The limited data collected in this survey does suggest that Red-throated Divers may be more sensitive to disturbance. Previous research and observations have indicated that this species is very sensitive to disturbance:

Topping and Petersen (2011) state that Red-throated Divers often flush at distances of about 1 km from an approaching ship, while Schwemmer *et al.* (2011) detail research that they carried out in the German North Sea in which they determined that Red-throated Divers and Black-throated Divers avoid active shipping lanes. However, the two Red-throated Divers that flushed in our survey did so at much closer distances from the boat than is implied by the above observations.

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