



Tern Species Habitat Use in Carlingford Lough

Produced by

AQUAFAC International Services Ltd

On behalf of

Warrenpoint Harbour Authority

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1. Introduction

AQUAFAC International Services Ltd. were sub-contracted by Royal Haskoning on behalf of Warrenpoint Harbour Authority to carry out bird surveys in the vicinity of the newly proposed spoil disposal site within Carlingford Lough. The spoil disposal site is located c. 350m from Green Island, which hosts a breeding tern colony.

The objective of the reported surveys was to assess local scale habitat use by Tern species at the proposed dredge disposal site. Habitat use was assessed using two methods, focal animal follows and point observations from within the proposed disposal site.

2. Conservation Designations

Carlingford Lough is designated for two Special Protection Areas (SPAs) under the EU Habitats Directive one in Northern Ireland and one in the Republic of Ireland. Carlingford Lough SPA Northern Ireland (Site Code: UK9020161) is designated because of its internationally important wintering (non-breeding) population of Light-bellied Brent geese (*Branta bernicla hrota*) and breeding populations of common (*Sterna hirundo*) and sandwich terns (*Sterna sandvicensis*). Green Island hosts a breeding colony of terns and is included in the Carlingford Lough SPA. It is located c. 350m from the proposed disposal site. This SPA is also a Ramsar site as designated under the Convention on Wetlands of International Importance (UK12004).

Carlingford Lough SPA Republic of Ireland (Side Code: IE004078) is located c. 800m from the proposed disposal site. This site is also designated for its internationally important wintering (non-breeding) population of Light-bellied Brent geese.

The Carlingford Lough SPA Northern Ireland overlaps with an Area of Special Scientific Interest (ASSI); Carlingford Lough ASSI (ASSI103) and this site holds nationally significant numbers of wintering Great Crested Grebe, Shelduck, Scaup, Red-breasted Merganser, Oystercatcher, Dunlin and Redshank.

Both SPAs are also Important Bird Areas.

Figure 2.1 shows the locations of the bird conservation sites in relation to the proposed disposal site.

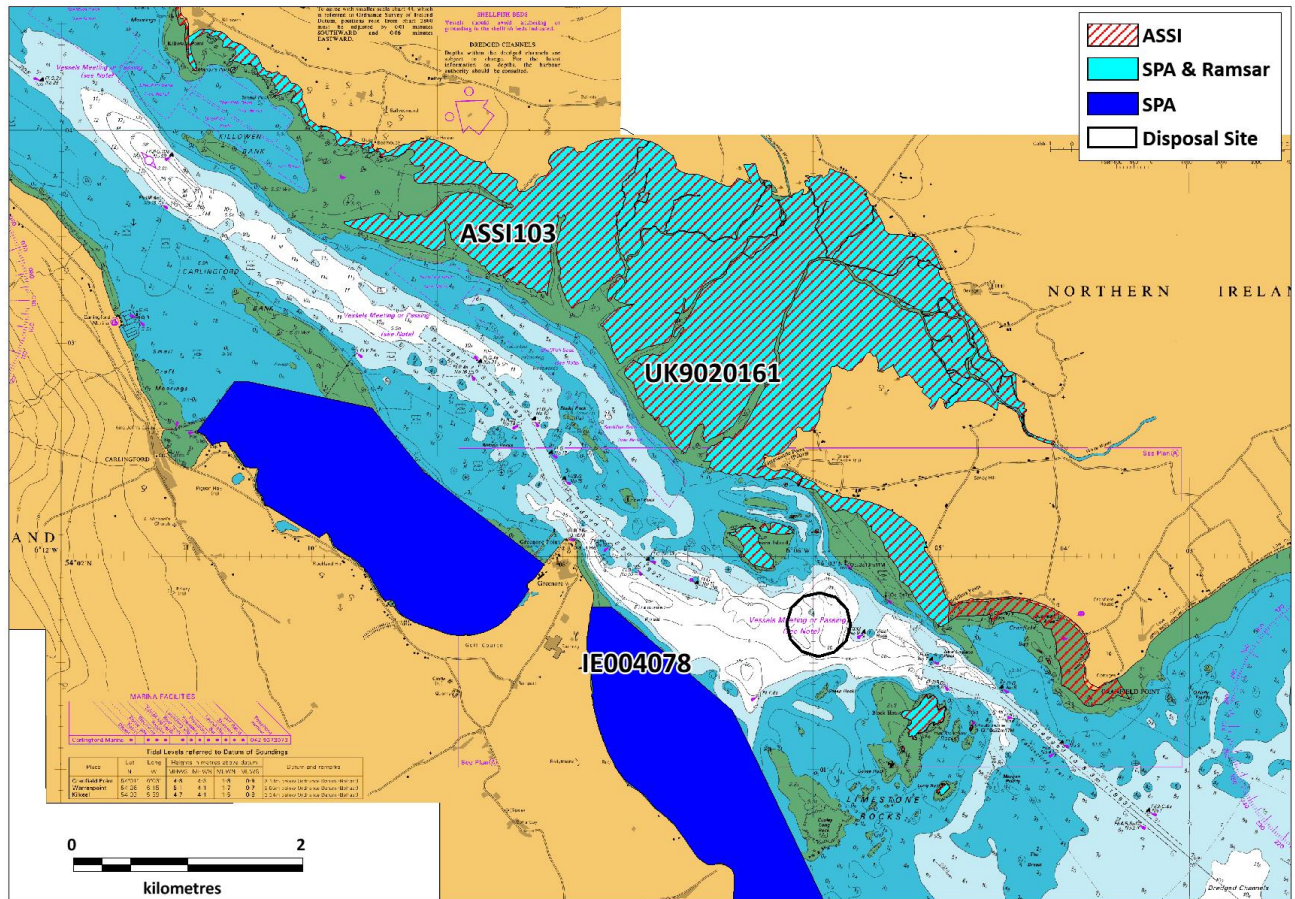


Figure 2.1: Conservation sites in the vicinity of the proposed disposal site

3. Survey Methodology

Figure 3.1 shows the study area, location of Tern colony and proposed dredge disposal site. Three surveys were conducted, and the survey team comprised a RIB driver and two bird observers, primary observer and a recorder. The RIB was used in order to facilitate focal animal following.

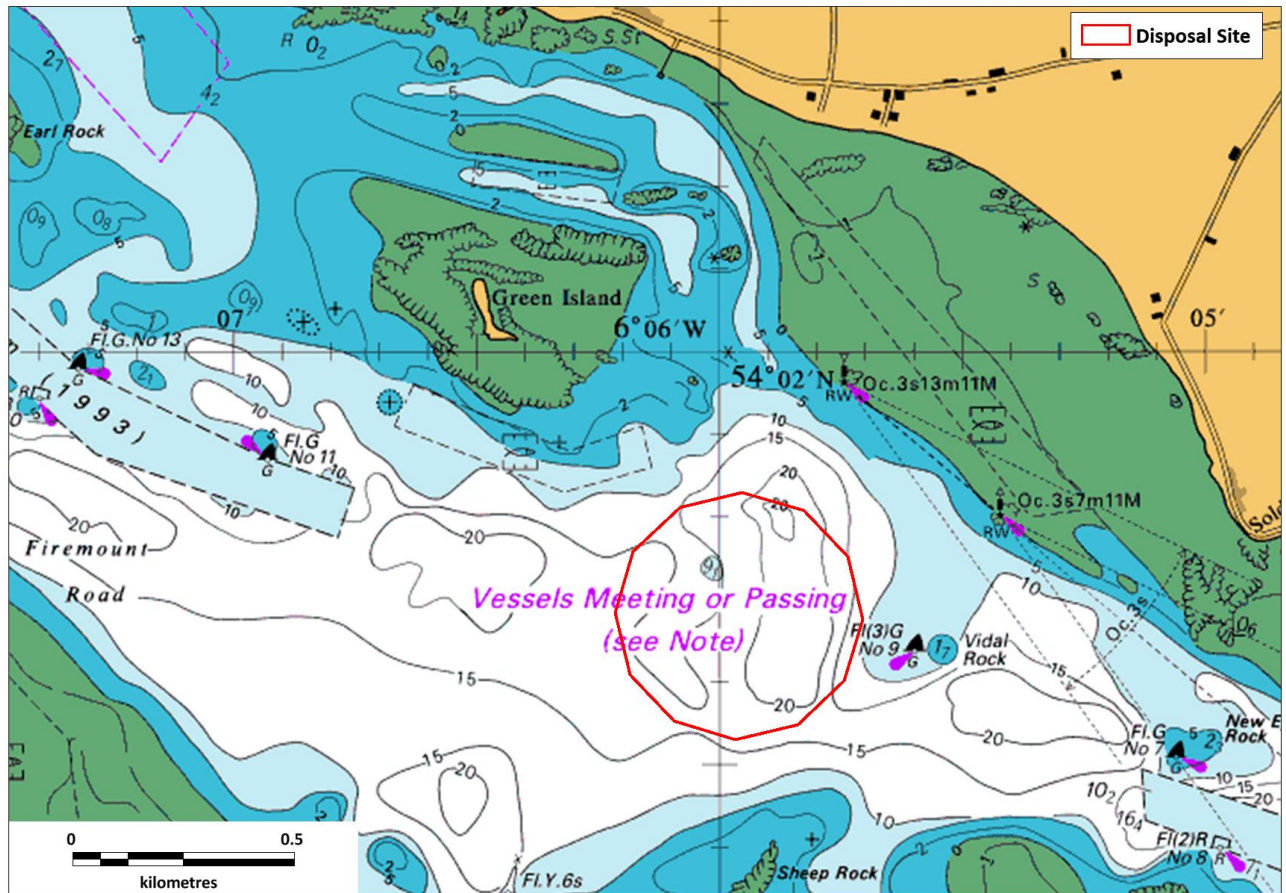


Figure 3.1: Proposed dredge disposal site Green Island (Tern colony)

3.1. Colony count

On commencement of each survey the colony was visited to obtain some information on the approximate numbers of each species present. These data are presented in Table 4.1.

3.2. Visual tracking

Visual tracking (focal animal following) was conducted following the method described by Perrow *et al.* (2011) for quantifying the use of the marine environment by Terns of known colony of origin. Visual tracking was achieved using a RIB to follow individual Terns departing from the breeding colony. Two fixed departure points were used to detect birds departing the colony, one to the south east, between the colony and the disposal site, the second to the north west of the colony. Onboard GPS recorded the vessel position while following each bird. The RIB was kept c.50-100m from the bird being followed and as such the vessel track represents the track of the bird.

The primary observer maintained visual contact with the bird being followed, and continuously called out visible behaviours (as described in Table 3.1) to the secondary observer and directions to the RIB driver. The secondary observer recorded visible behaviour data using Timestamped Field Notes and assisted with maintaining contact with the bird and providing directions to the RIB driver. Recorded behaviours were assigned to locations based on the common time between observations and the GPS track log. Care was taken to note any changes in behaviour which may have resulted from the presence of the RIB. Each animal was followed until it either:

- a) Reached the outer limits of the study area (classified as out to sea), approximately 2km to the south west of the colony
- Or
- b) Returned to colony after a successful foraging event

Table 3.1: Classification and description of behaviour (after Wilson *et al.* 2014)

Behaviour category	Continuous or instantaneous	Description
Direct flight	Continuous	Clear and consistent direction, usually fast, often adopted when flying back to the colony with a fish.
Transit search	Continuous	Slower than direct flight, direction can change but not erratically, head can be down, as though opportunistically searching while in transit. The usual flight type when not actively searching.
Active search	Continuous	Actively searching for food: head down, erratic flight course, lower flight speed, hovering, swooping and/or circling around; includes instantaneous foraging behaviours of diving and surface feeding.
Plunge dive	Instantaneous	Diving from a height, head first. All or mostly submerged.
Surface dip	Instantaneous	Diving from close to the water surface, sometimes 'feet first'. Partially submerged.
Surface peck	Instantaneous	Picking item from the surface with bill, no submerging.

3.3. Point observations

In order to describe local scale habitat use within the proposed dredge disposal site, observers conducted boat based fixed point observations using the snapshot technique from within the disposal site. The size of the site was such that it was possible to observe the entire site from a single point. The location of the site was such that it was possible to determine whether a bird was flying towards the colony (to colony) or away

from the colony (to sea or inland). Behaviour (as per Table 3.1) for each bird observed was recorded using time stamped field notes and an attempt was made to schedule observations during various stages of the tide. Scheduled observations had to be accommodated during intervals between focal animal follows and were also subject to occasional disruption from merchant vessel movements. Dates, tide times and observation periods are described in Table 4.2.

Previous authors (Wilson *et al.* 2014) have reported that as the three species of Tern being surveyed were likely to be encountered in the air they are readily detected out to a distance of 300m by observers at or below the height of the birds. The observation point was at approximately 270m from the edge of the proposed disposal site and only birds within the disposal site were recorded. Incidental observations of obvious multi species feeding assemblages outside the proposed disposal site were noted when detected.

A snapshot count and behaviour classification were conducted at 1-minute intervals during the point observations. Previous authors (Wilson *et al.* 2014) have reported on the use of snapshot counts for fixed survey locations and that such counts provide a more representative description of the relative frequency of each behaviour type within the area. Accordingly, as the primary aim of the current study was to assess how Terns were using the proposed disposal site the snapshot method was used to determine the numbers of birds within the site at each interval and their behaviour classified as either Foraging (Active Search, Transit Search, Plunge, Peck, Dip), or Non Foraging (Direct Flight).

4. Survey Results

4.1. Survey details

Three surveys were conducted, these are described in Table 4.1. Colony counts, focal animal follows and timed observations within the proposed disposal site were conducted during the June and July surveys. No Terns were present at the breeding colony on August 2nd as the Terns had already dispersed from the colony and therefore it was not possible to conduct focal animal follows as no Terns were detected leaving the colony during the time allocated to that activity; and very limited data are available for the timed observations within the proposed disposal site due to the relative absence of birds from the area. On August 2nd, multi species feeding assemblages of >50 Terns were observed to the east and west of Haulbowline Lighthouse. In addition, >60 adult and recently fledged Terns (all three species) were loafing in the intertidal on the northern shore of the entrance to the lough near soldier's point. At this location they were subject to intermittent disturbance by walkers and their dogs.

Table 4.1: Survey dates and conditions

Date	Weather	Sea State	Cloud
June 22 nd 2018	Excellent, no rain, 18-21 °C	0	0/8
July 3 rd 2018	Excellent, no rain, 19-24 °C	0	0/8
August 2 nd 2018	Fair, no rain, 18 °C	1-2	6/8

Table 4.2: Details of timed observation periods

Date	High Water	Low water	Observation periods	Duration	Snapshots
June 22 nd 2018	07:48	14:03	11:08 – 11:40 13:57 – 14:58 16:23 – 17:00	32 minutes 60 minutes 37 minutes	129
July 3 rd 2018	09:42	15:43	11:16 – 12:14 15:08 – 15:59	58 minutes 51 minutes	111
August 2 nd 2018	09:05	15:54	10:43 – 11:43	60 minutes	61

Table 4.3: Estimates of numbers of individuals at colony on commencement of survey

Date	Common Tern	Arctic Tern	Sandwich Tern	COMMIC
22 nd June 2018	6		84	62
July 3 rd 2018			10	110
August 2 nd 2018	0	0	0	0

4.2. Visual tracking

Survey and species totals for visual survey tracking are presented in Table 4.4. Observers did not detect changes in behaviour, such as evasive flying, alarm calling or changes in foraging rates, which might indicate an adverse reaction of the birds to the presence of the vessel. On July 3rd tracking of one Common Tern (CN#2) had to be abandoned due to the proximity of a merchant vessel, and CN#7 was abandoned due to mobbing behaviour in the presence of a Buzzard (*Buteo buteo*). Figure 4.1 illustrates the spatial extent for all species and all tracks for the surveys in June and July, it was not possible to track birds from the colony during the August survey as no birds were detected leaving the colony from either predetermined departure

point. For the June surveys, birds were followed from both points, such that birds heading towards and away from the disposal site were tracked. The July survey only tracked birds heading towards the disposal site, this was because despite two periods of 30 minutes waiting at the departure point to the north west of the colony, no birds were detected leaving the colony from that point.

Table 4.4: Number of focal animal follows by species and survey, the presence of figures in parentheses indicates the number of tracks that had to be abandoned

Date	Arctic terns	Sandwich terns	Common terns	Survey total
June 22 nd 2018	14	8	1	23
July 3 rd 2018	9	0	12 (2)	21 (2)
August 2 nd 2018	-	-	-	-
Species total	23	8	13 (2)	44 (2)

4.2.1. Direction of Travel

A breakdown of the direction of travel of all birds tracked from the colony is presented in Table 4.5, with the figures in parentheses representing the %.

Table 4.5: Direction of travel of all tracked birds (n=44)

Date	Towards Disposal site (%)	Away from disposal site (%)
June 22 nd 2018	13 (56.5)	10 (43.5)
July 3 rd 2018	19 (90.5)	2 (9.5)
Total	32 (73)	12 (27)

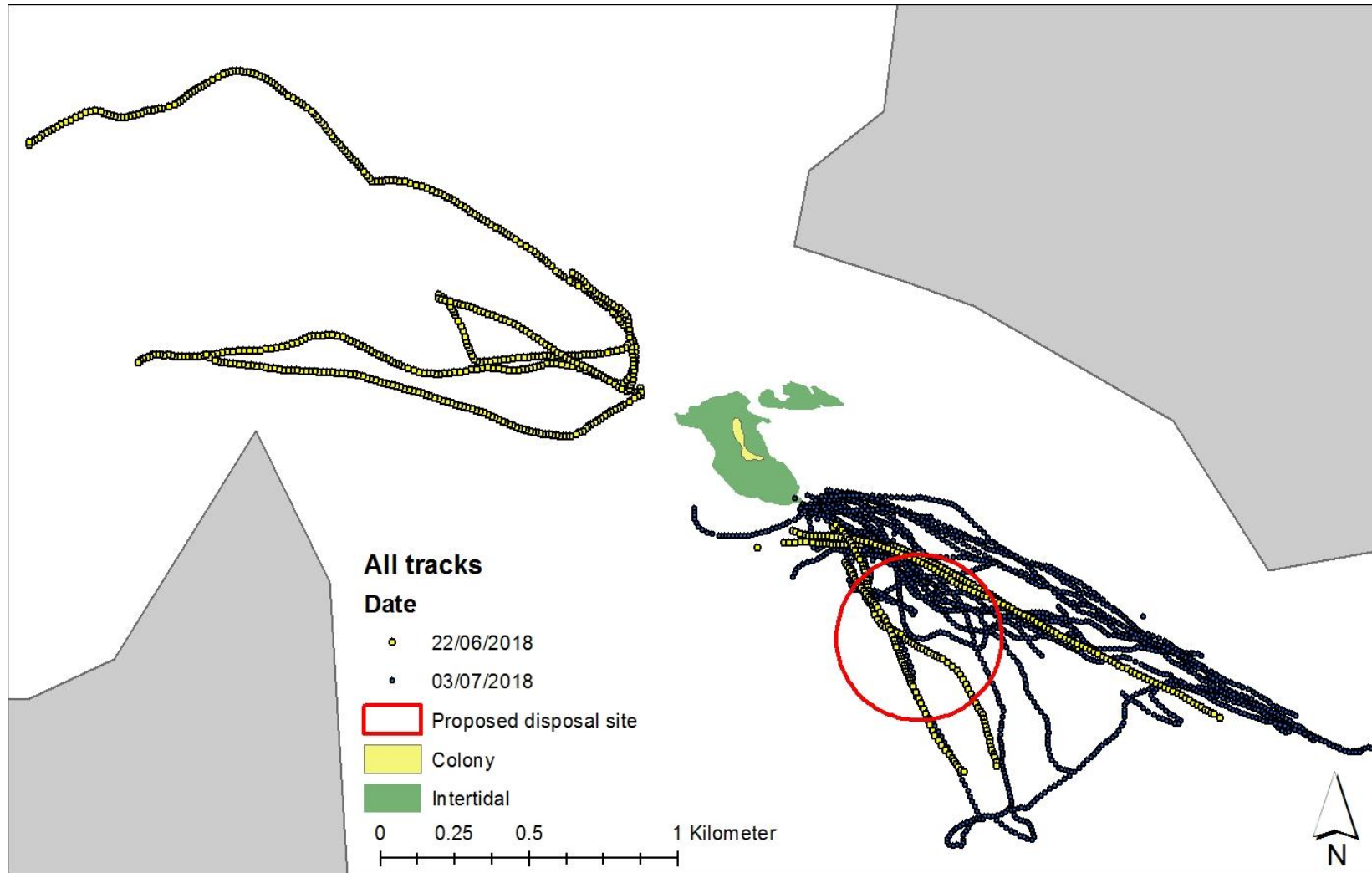


Figure 4.1: Spatial extent of all successful tracks for June and July surveys

4.2.2. Behaviour within the Study Area

Focal animal behaviour data for all species, all tracks and all surveys are aggregated into a binary classification, Foraging (to include Active/Transit search, Plunge dive, Surface dip and Surface peck) and Non Foraging (to include Direct flight); Foraging is the dominant behaviour recorded within the Lough (see Figures 4.2 and 4.3). Though it should be noted that it is not uncommon for Terns to break off from Direct Flight to exploit a foraging opportunity.

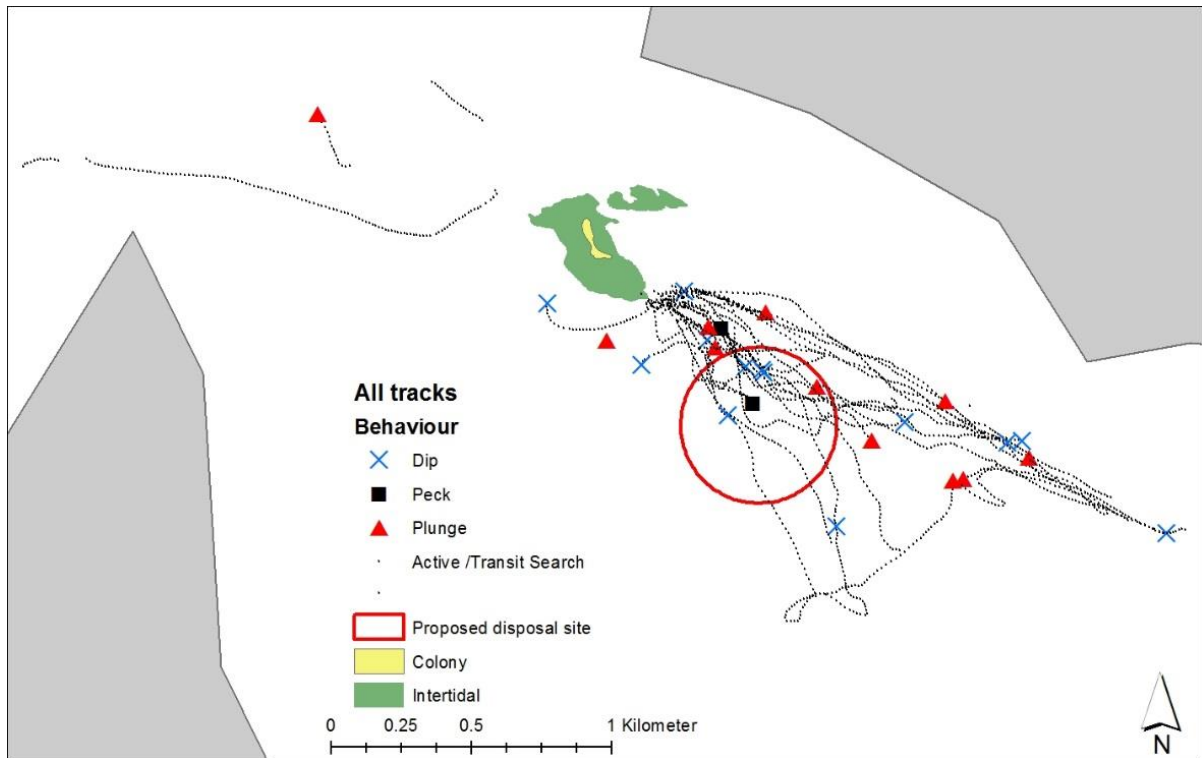


Figure 4.2: Foraging behaviour, all species, all tracks, all surveys

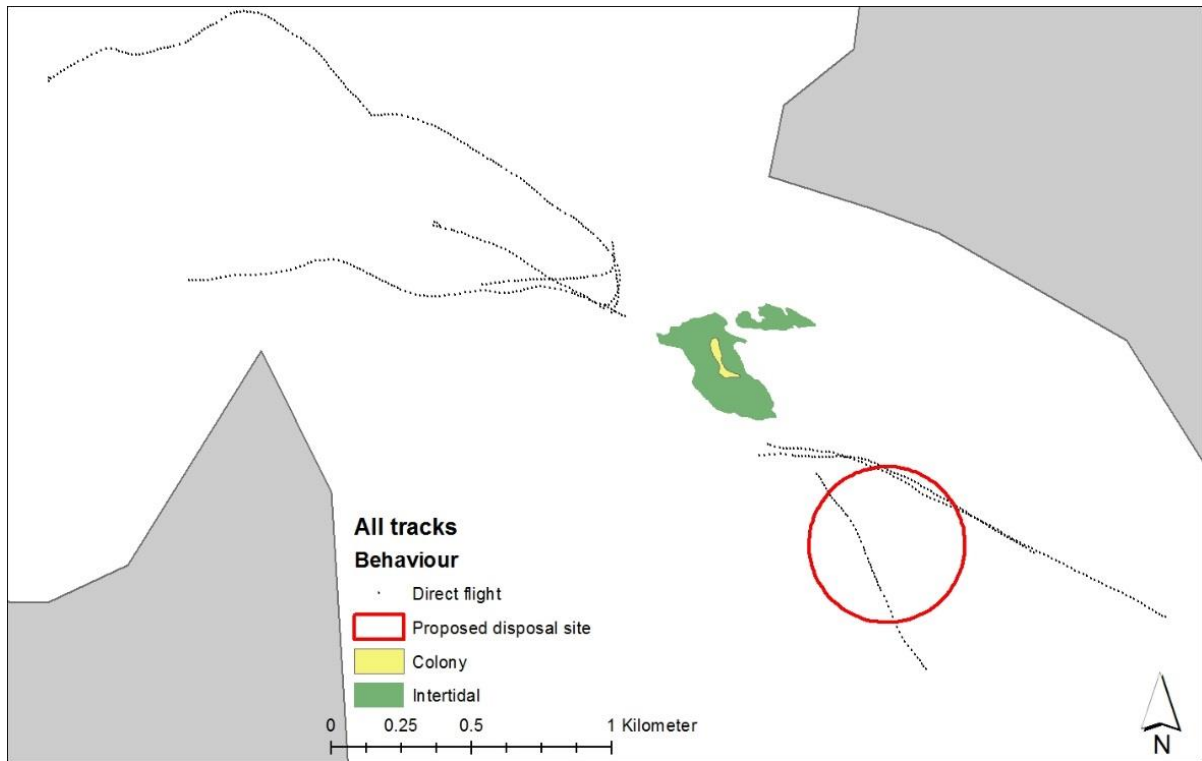


Figure 4.3: Non foraging behaviour, all species, all tracks, all surveys

As Transit search is a less directed form of foraging, it may be possible to exclude that behaviour from the Foraging classification, this was done to illustrate the degree to which Transit search contributes to the Foraging classification (See Figures 4.4 and 4.5)

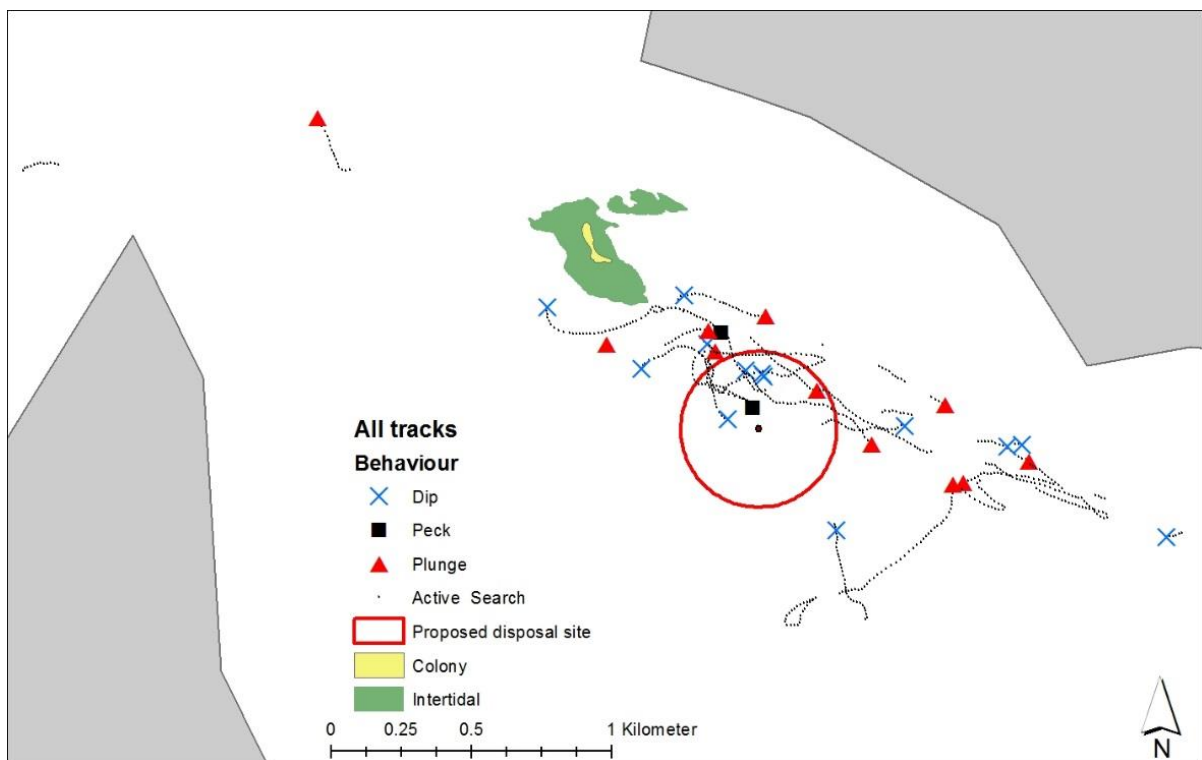


Figure 4.4: Foraging (active search, peck, dip, plunge) excluding Transit search

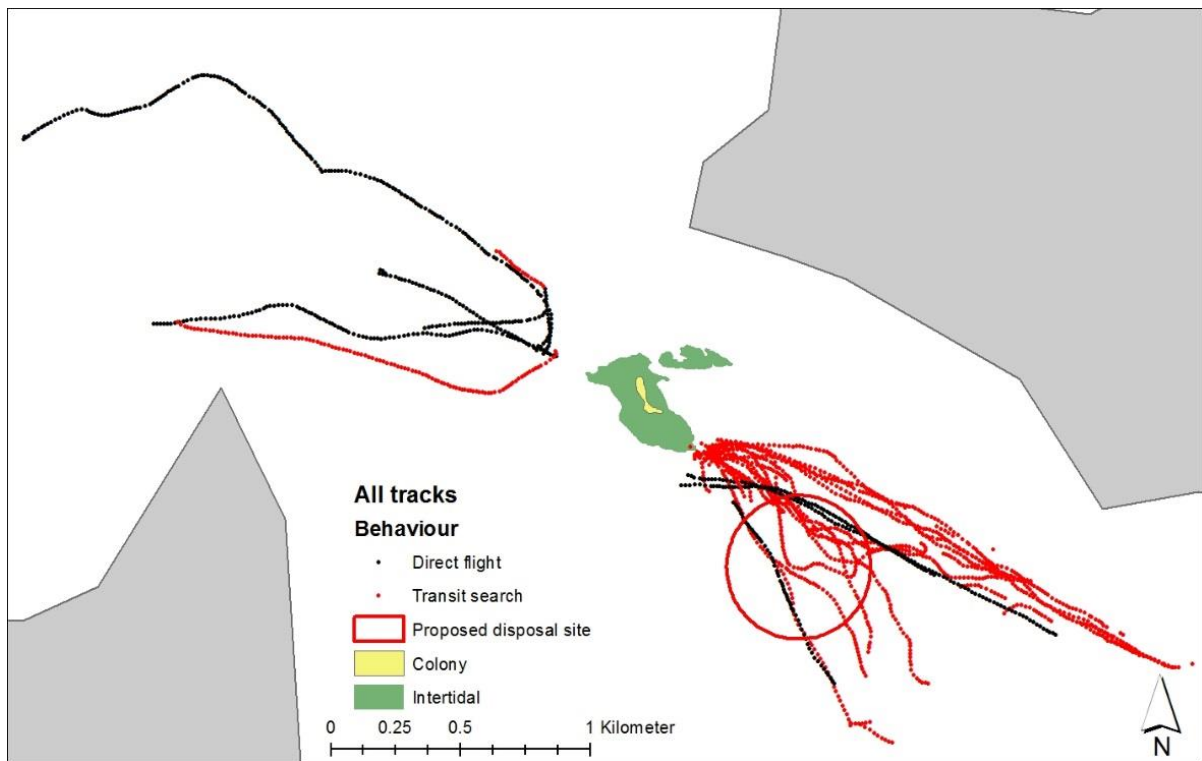


Figure 4.5: Direct flight and Transit search, all tracks

4.2.3. Provisioning Behaviour

Of the 44 animals tracked, 13 were observed catching prey and returning to the colony with the prey items, predominantly small fish; though in one instance the prey item was not a fish but could not be identified by the observers. Of those 13 instances of provisioning, only two were detected as occurring within the proposed disposal site. Figure 4.6 illustrates the distribution of Provisioning events.

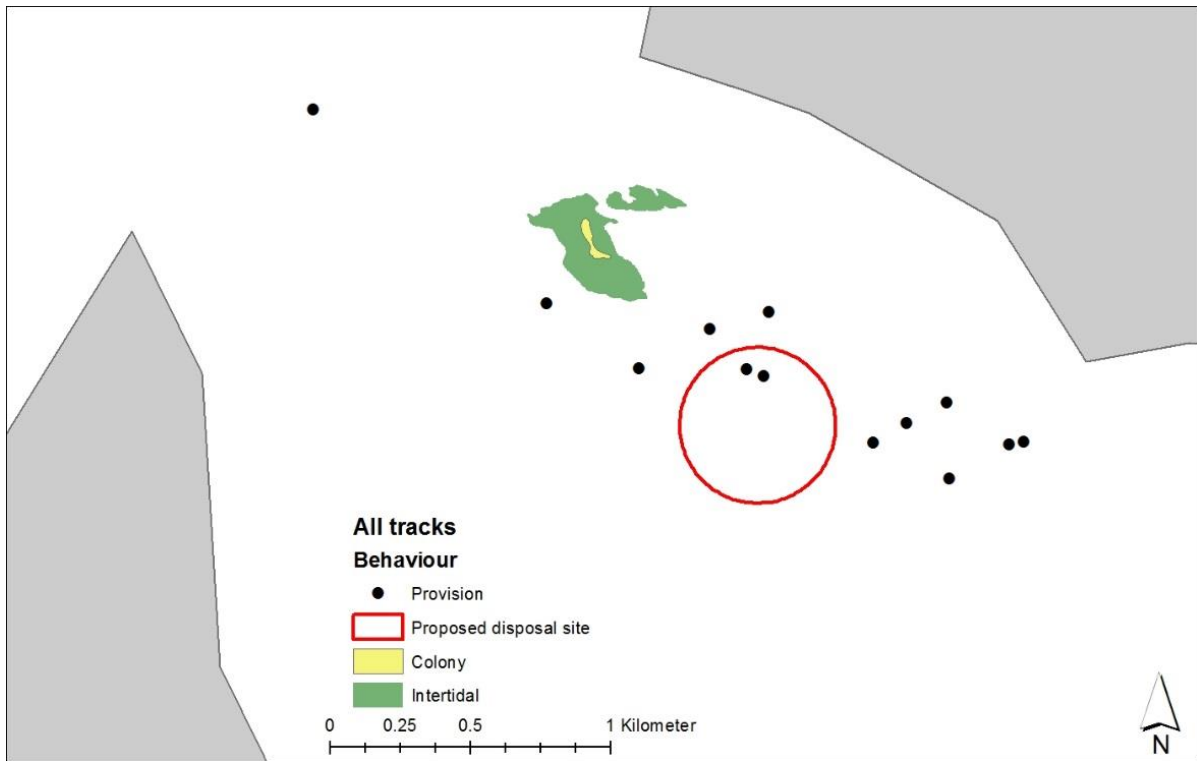


Figure 4.6: Detection of provisioning during tracking

4.2.4. Presence within the Proposed Disposal Site

Of the 44 tracks commenced, 32 were towards the disposal site, an examination of whether each followed bird passed through the proposed disposal site at any stage during the tracking, is presented in Table 4.6. Tracks that entered and did not enter the disposal site are presented in Maps 8 and 9.

Table 4.6: Summary of birds tracked in direction of disposal site that entered site

Date	Enter disposal site (%)	Not enter disposal site (%)
June 22 nd	9 (69)	4 (31)
July 3 rd	12 (63)	7 (37)
Total	21 (73)	11 (27)

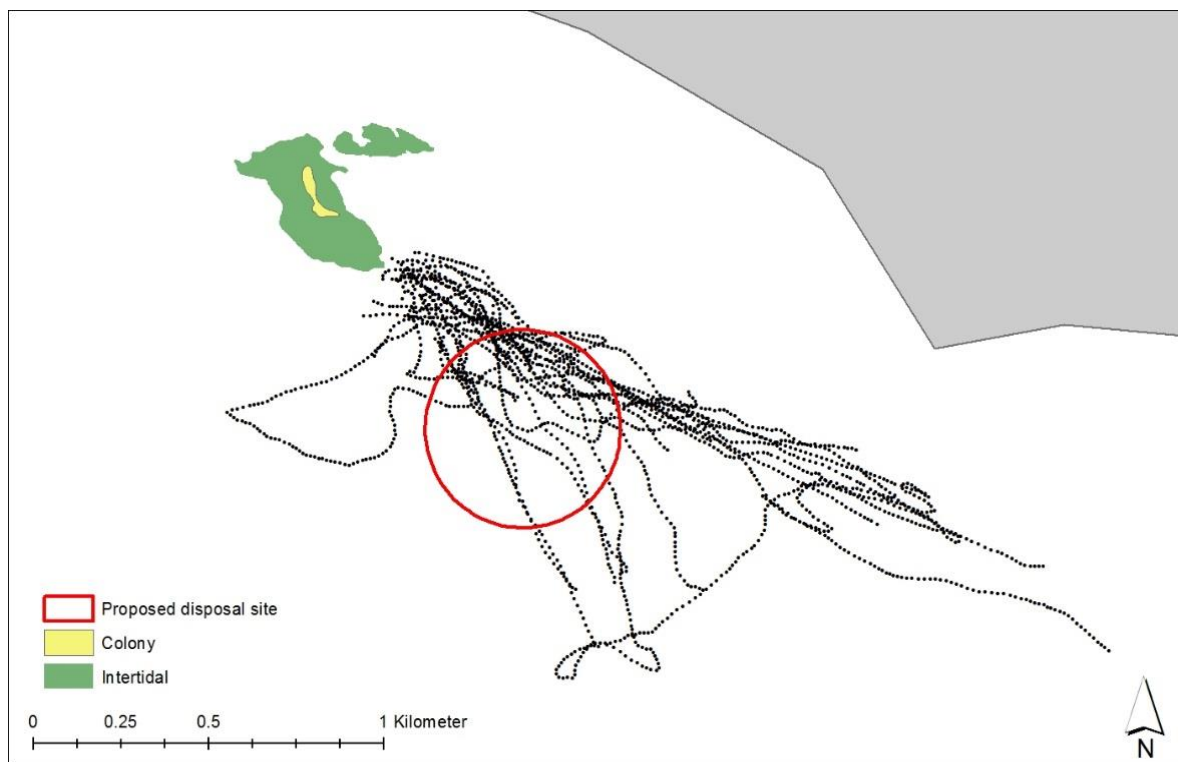


Figure 4.7: Tracks traveling towards and entering the disposal site

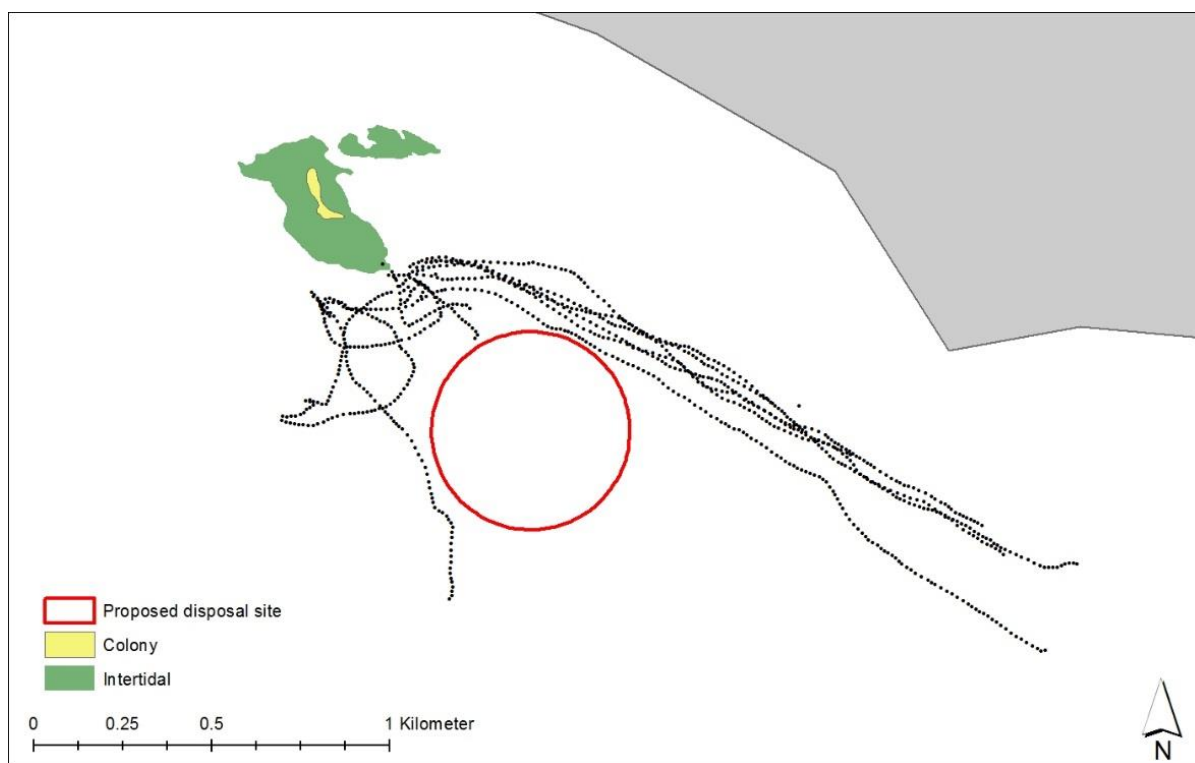


Figure 4.8: Tracks travelling towards, but not entering the disposal site

4.2.5. Snapshots at Fixed Point

Table 4.7 provides details of the birds detected during one-minute snapshot intervals during the fixed-point observations. A total of 301 snapshot intervals were taken, birds were detected within the proposed disposal site for 38 of those.

Table 4.7: Birds detected during 1-minute snapshot intervals during fixed point observations

Date	Foraging within proposed disposal site (%)	Not foraging with the proposed disposal site (%)
June 22 nd	11 (42)	15 (58)
July 3 rd	10 (37)	17 (63)
Total	25 (47)	28 (53)

The data for August 2nd are omitted from the table due to the very low numbers of birds and there was only a single detection within the 61 snapshots, this was of 3 Terns not foraging.

5. Summary

Three boat-based surveys were undertaken to assess habitat use by three species of Tern in relation to a proposed dredge disposal site within Carlingford Lough. Surveys were in June, July and August 2018 and each survey comprised:

- An estimation of the numbers of birds at the colony
- Fixed point observations (including snapshots) from within the proposed disposal site
- Individual animal tracking of Terns leaving the colony.

In June and July the number of Terns at the colony was estimated at between 110 and 142 respectively. No Terns were present at the colony during the third survey (on August 2nd). During the August survey multi species feeding assemblages of Terns were observed at the outer edges of the study area; adult and recently fledged juveniles were detected loafing on the northern shore at the outer part of the lough.

A total of 44 focal animal follows were conducted; 23 during the June survey and 21 during the July survey. No Terns were detected leaving the colony during the August survey. Focal animal follows were initiated at both the proximal and distal ends of the colony in relation to the location of the disposal site.

Of all tracked Terns in the Lough:

- >70% (n=32) travelled towards the proposed disposal site;
- Of those, 73% (n=21) entered the proposed disposal site, or approximately 50% of all

tracked birds;

- Foraging was the dominant behaviour classification;
- Transit search (a subclass of Foraging) was the dominant foraging behaviour;
- Provisioning was detected in 30% (n=13) of tracked birds, with only 5% (n=2) of tracked birds provisioning within the proposed disposal site.

While the presence and behaviour of birds was continuously recorded during the point observations, data from the snapshots (at 1-minute intervals) were used to classify behaviour within the proposed disposal site, previous authors (Wilson *et al.*, 2014) have indicated this provides a more objective measure than continuously recording numerous behaviours from individual birds.

Of the snapshot observed Terns within the proposed disposal site:

- All three species of Tern were detected;
- June survey, 42% of snapshot birds were foraging and 58 % were not foraging
- July survey, 37% of snapshot birds were foraging and 63 % were not foraging

Overall, a total of 47% of Terns detected were foraging and 53% were not.

6. References

- Perrow, M., Skeate, E.R. & J.J. Gilroy. 2011. Visual tracking from a rigid-hulled inflatable boat to determine foraging movements of breeding terns. *J. Field Ornithol.* **82(1)**: 68–79
- Wilson L. J., Black J., Brewer, M. J., Potts, J. M., Kuepfer, A., Win I., Kober K., Bingham C., Mavor R. & Webb A. 2014. Quantifying usage of the marine environment by terns *Sterna* sp. around their breeding colony SPAs. JNCC Report No. 500

